Appendix H - Evaluation of Potential Projects

H.1 Introduction

Ten potential projects were analyzed to determine potential for peak flow reduction at Vernon Street. The potential peak flow impact was determined using hydrology developed from the General Plan build-out land use with LID and with the 2010 hydraulic system geometry, including the Miners Ravine Off-Channel Detention Basin and adjustments to Sierra College Boulevard at Secret Ravine. The locations of the ten potential projects are shown on Plate H.1. Seven storm centerings that caused peak flows at key locations in the watershed were used to determine localized peak flow rates and the localized impact of the projects. Of the seven storm centerings that were analyzed, the SE40N@0 storm centering caused the highest peak flow rate at Vernon Street. Each of the potential projects listed below was modeled with the 100-year SE40N@0 storm centering to determine the impact on peak flow rates at Vernon Street. Additionally, each potential project was modeled with the 100-year storm centering from the set of seven that produced the highest local peak flow rate to determine the local impact of the project. Because only seven centerings were used in the analysis, the local centering is not necessarily the 100-year flow, which may be higher.

The projects increase flood storage volume through excavation, off-channel detention, or in-channel weirs that would increase water surface elevation.

Most of the potential projects are based on the use of an in-channel weir that will clear-span an opening across the low flow channel. The objective of this concept is to minimize the environmental impacts of a system that would allow unimpeded passage of frequent flows while detaining high flows. The proposed approach would not restrict fish passage and would minimize the need for grading and clearing of vegetation due to the small footprint of a weir compared to a dam. Table H.1 summarizes calculated peak flow reduction and is provided below.

Table H.1 Summary of peak flow reductions near the potential project location and at Vernon Street for SE40N@0 centering and the local centering causing the highest local peak flow

			Baseline SE40N@0 Centering		Local Centering		
	Stream	**Project Location**	**Local Peak Flow Reduction (cfs)**	**Peak Flow Reduction at Vernon (cfs)**	**Local Centering**	**Local Peak Flow Reduction (cfs)**	**Peak Flow Reduction at Vernon (cfs)**
1	Antelope Creek	Atlantic Street	446	825	AC5I60	323	490
2	Linda Creek	Auburn-Folsom Road	45	12	LC5A	66	25
3	Linda Creek	Wedgewood Drive	33	13	LC5A	67	44
4	Linda Creek	Old Auburn Road	68	28	LC40L	48	34
5	Linda Creek	West of Rocky Ridge Drive	27	9	LC40L	NA	NA
6	Miners Ravine	WWTP near Dick Cook Road	308	-6	MR15J	130	-6
7	Miners Ravine	East of Roseville Parkway	Project not feasible				
8	Secret Ravine	Sierra College Boulevard	68	175	SE40M	57	188
9	Strap Ravine	McLaren Drive at Maidu Park	156	-35	CC5G_90	148	-35
10	Secret Ravine	Vista Oaks	103	0	SE40M	288	62

H.2 Dick Cook Wastewater Treatment Plant Decommissioning

The wastewater treatment plant near Dick Cook Road on Miners Ravine is scheduled to be decommissioned. Significant flooding problems occur about five miles downstream in the Joe Rodgers area. A potential flood control project at the wastewater treatment plant site was analyzed to determine its effectiveness for reducing peak flow rates in the Joe Rodgers area and at Vernon Street.

Including the adjacent parcels, approximately 12 acres of surface area could be available for a flood control project. Conceptually, a potential project could include a berm adjacent to Miners Ravine on the north and west sides of the project site that would allow for increased water levels on the project site, as well as culverts or inlet boxes to control the flows entering the project site. The potential flood control project at the decommissioned wastewater plant site would allow low flows to pass through and detain peak flows. Plate H.2 shows a map of the potential project area.

For the SE40N@0 centering, the analyzed configuration would reduce peak flows at the

Joe Rodgers area by only 21 cubic feet per second (cfs), and would cause a net increase of six cfs at Vernon Street. Because the peak flow on Miners Ravine occurs after the peak flow at Vernon Street, the elimination of floodplain storage at the project site for the lower flows would cause an early increase in flow rates downstream. Adjacent to the project site, the potential project may increase the maximum water surface elevation which would cause increased flooding of the development on the right (west) bank. Table H.2 summarizes the FEMA FIS (2001), pre- and post-potential project conditions from the model used for project analysis.

Table H.2 Water Surface Elevations (feet) for Locations Impacted by Potential Project at the Wastewater Treatment Plant Site Near Dick Cook Road on Miners Ravine

		SE40N0			MR15J@30		
Location	FEMA (2001)	No Project	With Project	Project Delta	No Project	With Project	Project Delta
Downstream from Leibinger Lane	362.0	360.51	360.48	-0.03	360.97	360.87	-0.1
Adjacent to potential project	488.0	487.7	488.25	0.55	488.41	489.44	1.03

Note: The FEMA water surface elevation is provided for reference and was not used in the analysis. It may be different from the current study model due to flow rate difference or other issues.

Chart H.1 and Chart H.2 show the flow hydrographs at Leibinger Lane in the Joe Rodgers area and at Vernon Street for the SE40N@0 storm centering.

Chart H.1 Flow Hydrograph at Leibinger Lane in the Joe Rodgers Area With and Without a Potential Project at the Wastewater Treatment Plant near Dick Cook Road

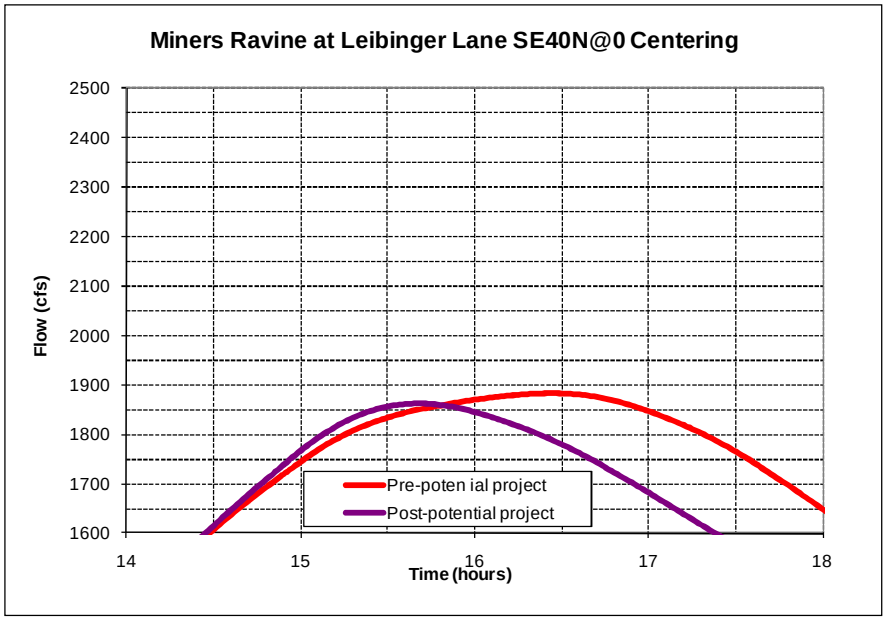
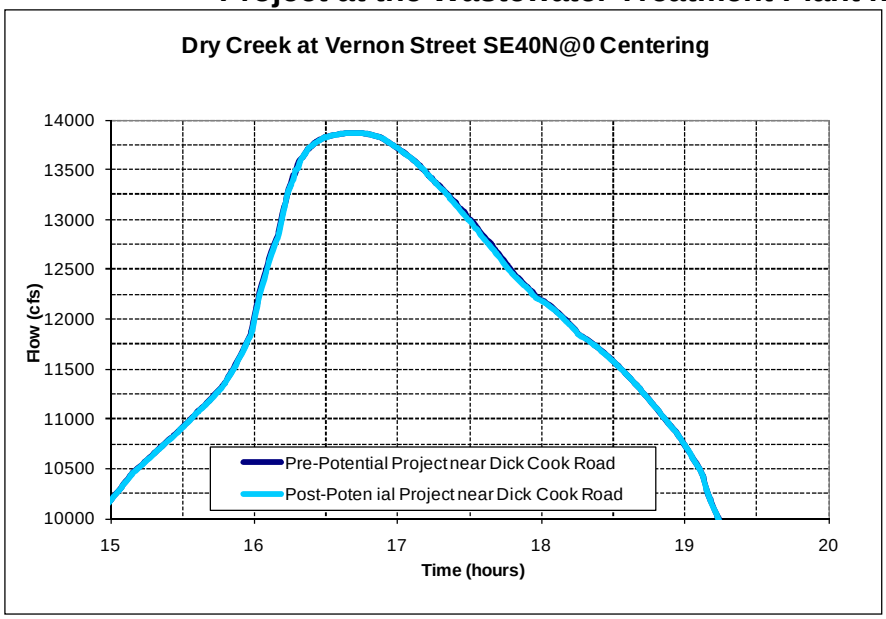


Chart H.2 Flow Hydrograph at Vernon Street With and Without a Potential Project at the Wastewater Treatment Plant near Dick Cook Road



Although the project site may provide a small flow and stage reduction in the Joe Rodgers area, the project is infeasible because of the net increase of peak flow rate at Vernon Street. The reduction in early floodplain storage causes acceleration in the peak flow rate for the project condition. The site is too small to effectively detain enough flow for a long enough duration to significantly reduce peak flow rates at both the Joe Rodgers area and at Vernon Street. No further action is recommended for this project site.

H.3 Auburn-Folsom Road on Linda Creek

Another potential project site is located on the upper portion of Linda Creek, upstream from Auburn-Folsom Road, adjacent to Cavitt Junior High School. The project site is approximately 6.5 acres and currently is undeveloped open space with some tree coverage. Plate H.3 shows the layout of the potential project site. The potential project site is within the preliminary FEMA floodplain. The project concept would add a berm on the right (west) bank of Linda Creek, creating an off-channel detention basin to divert and attenuate peak flows. Table H.3 summarizes the preliminary FEMA FIS, pre- and post-potential project conditions from the model used for project analysis. There is currently no effective FIS for the potential project area.

Table H.3 Water Surface Elevations (feet) for Locations Impacted by Potential Project at the Auburn-Folsom Road Site on Linda Creek

		SE40N0			LC5A0		
Location	FEMA (Nolte)	No Project	With Project	Project Delta	No Project	With Project	Project Delta
Downstream from Troy/ Purdy Lane	357.5	357.46	357.21	-0.25	357.69	357.62	-0.07

Flooding problems exist about one half mile downstream in the Troy/Purdy Lane area. The potential project could be designed to provide peak flow attenuation at Vernon as well as peak flow and water surface elevation reduction at the Troy/Purdy Lane area.

For the SE40N@0 centering, the potential project would reduce peak flows at Auburn-Folsom Road by approximately 26 cfs and at the Troy/Purdy Lane area by 45 cfs. This would result in a decrease of approximately two to four inches of peak water surface elevation. Additionally, the project would cause a 12 cfs reduction in peak flow rate at Vernon Street. Chart H.3, Chart H.4, Chart H.5, and Chart H.6 show flow hydrographs for the SE40N@0 Centering for Auburn-Folsom Road, Troy/Purdy Lane, and Vernon Street with and without the potential project.

Chart H.3 Flow Hydrograph at Auburn-Folsom With and Without Potential Project Above Auburn-Folsom Road

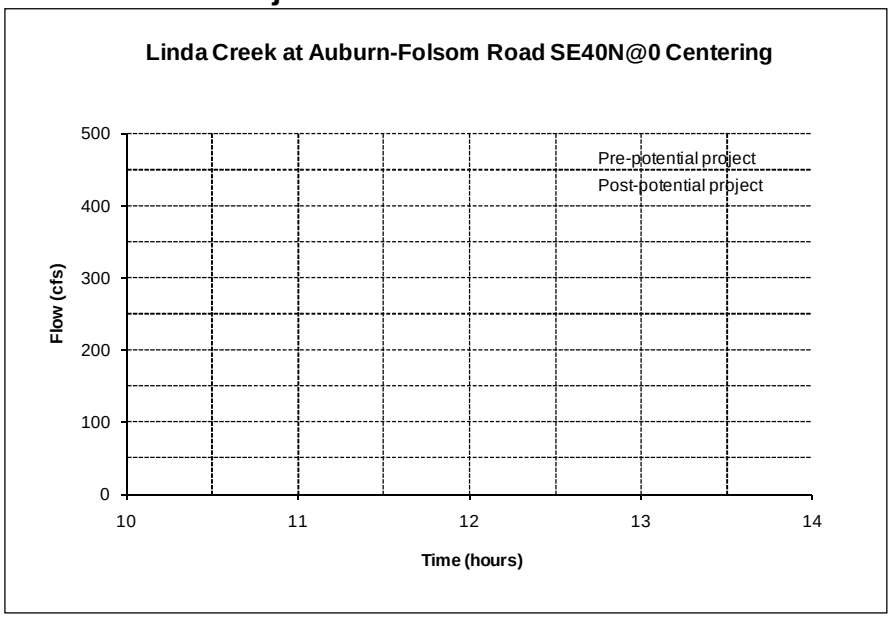


Chart H.4 Flow Hydrograph Just Downstream from Troy/Purdy With and Without Potential Project Upstream From Auburn-Folsom Road

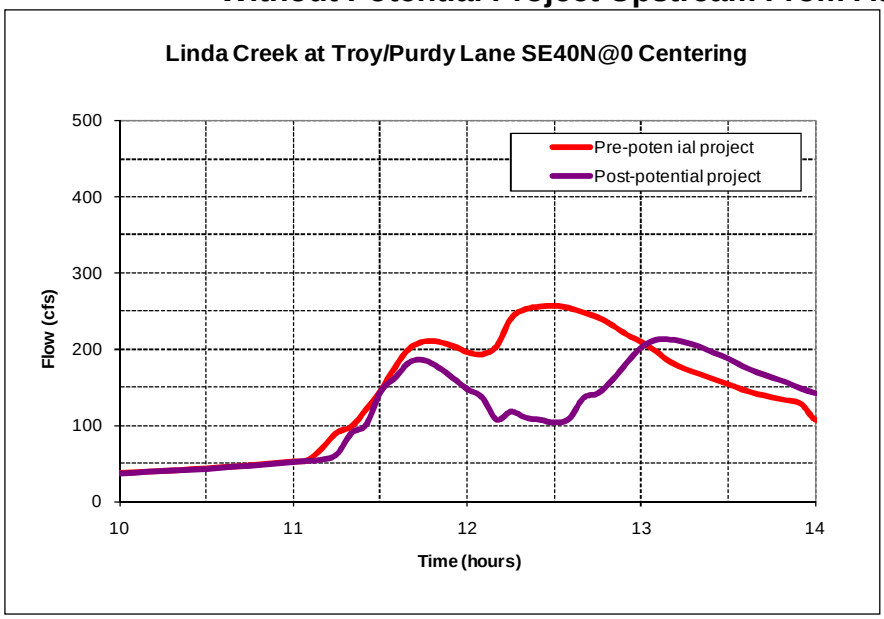
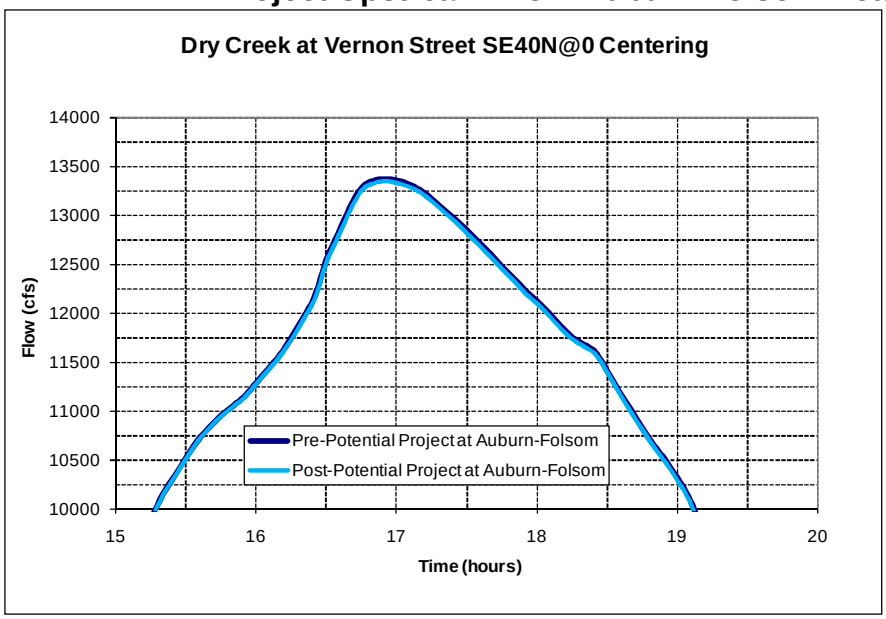


Chart H.5 Flow Hydrograph at Vernon Street With and Without Potential Project Upstream From Auburn-Folsom Road



For the LC5A@0 centering, the potential project would reduce peak flow rates at Auburn-Folsom Road by 40 cfs, the Troy/Purdy Lane area by 66 cfs, and the water surface elevation by 2-4 inches. Based on the LC5A@0 centering, the peak flow rate at Vernon Street would be reduced by 25 cfs. Chart H.6, Chart H.7, and Chart H.8 show flow hydrographs for the LC5A@0 centering at Auburn-Folsom Road, Troy/Purdy Lane and at Vernon Street.

The double peak in the flow hydrograph at Troy/Purdy Lane for the post-potential project scenario is due to a separate inflow hydrograph introducing flow into the system below the potential project site. The potential project delays the peak above Auburn-Folsom Road, as seen in Chart H.3 and Chart H.6. The inflow below Auburn-Folsom road produces a separate, earlier peak as shown in Chart H.4 and Chart H.8.

Chart H.6 Flow Hydrograph at Auburn-Folsom Road With and Without Potential Project Upstream From Auburn Folsom-Road

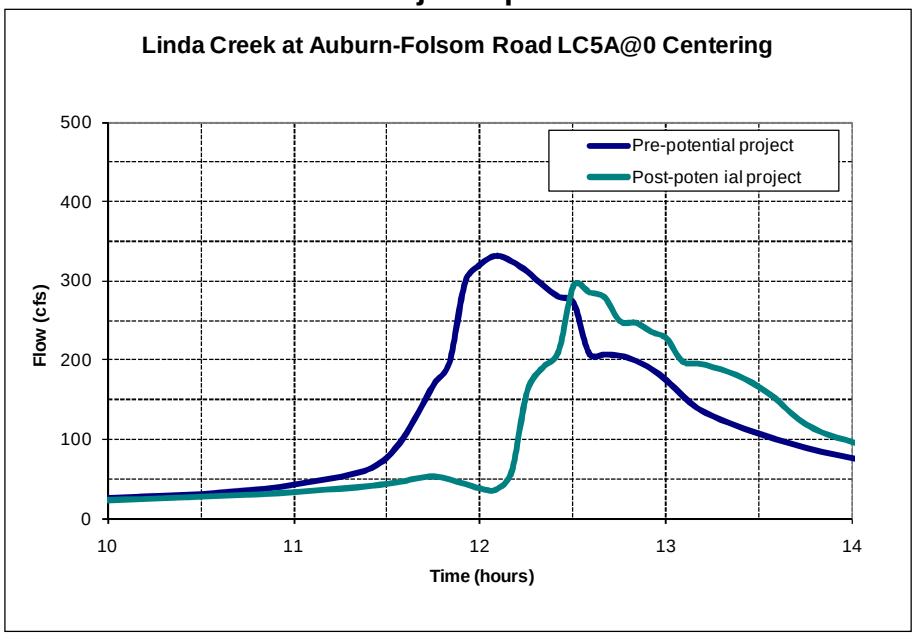


Chart H.7 Flow Hydrograph at Troy/Purdy Lane With and Without Potential Project Above Auburn-Folsom Road

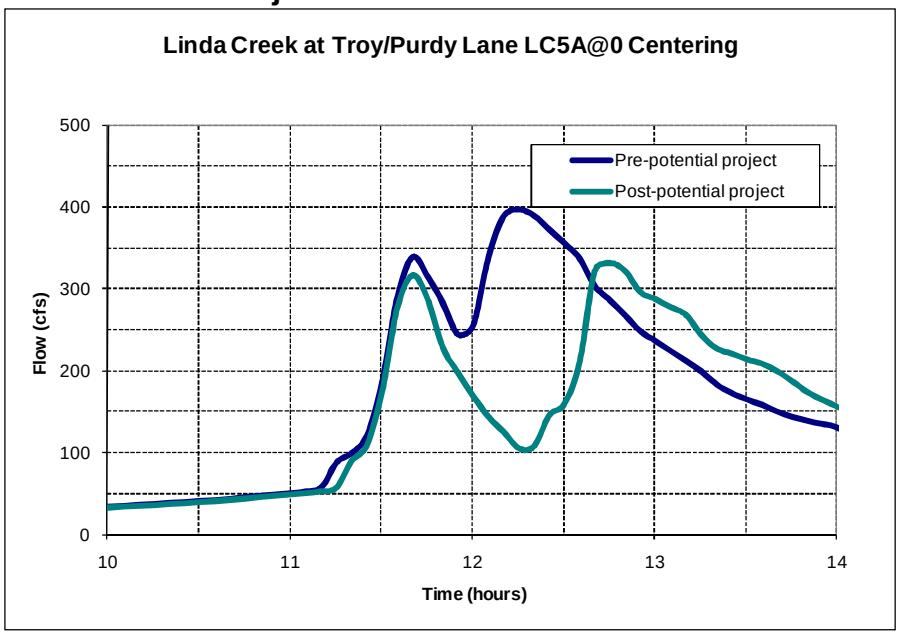
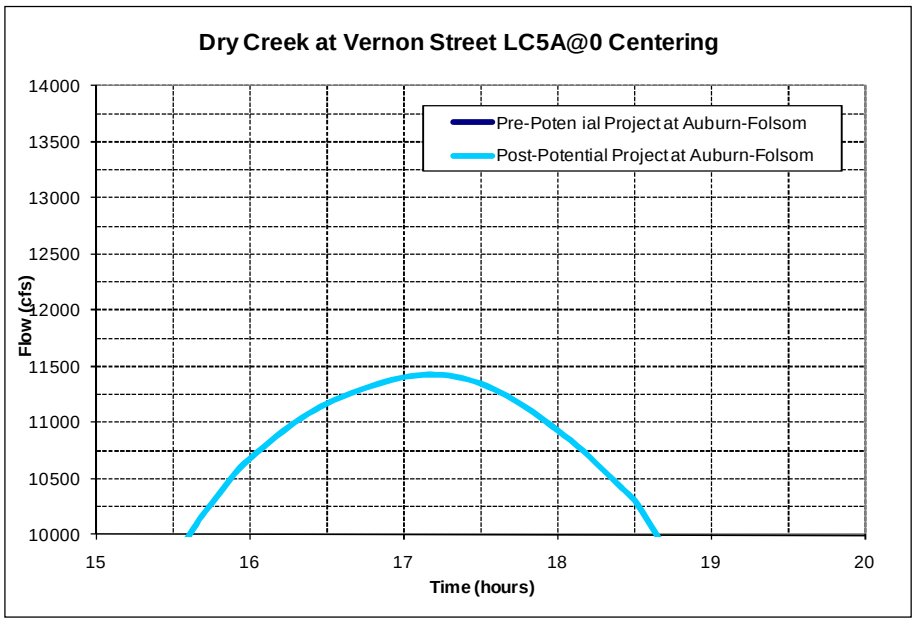


Chart H.8 Flow Hydrograph at Vernon Street With and Without Potential Above Auburn-Folsom Road



The project would require a berm of approximately 1,000 feet in length and 2-12 feet in height to create the off-channel detention basin. Additional storage volume may be created by excavating the potential project site; however, due to existing vegetation, excavation may be infeasible and was not considered for this analysis. The potential storage volume is approximately 20 acre-feet. Any project with less than 50 acre-feet of storage is not within the jurisdiction of the Division of Safety of Dams (DSOD). The area that would be inundated by the potential project is located in an existing floodplain.

The project analysis assumes that a one-foot diameter culvert would drain the detained volume. The detained volume would drain over a period of about 24 hours.

The potential project site above Auburn-Folsom Road on Linda Creek near Cavitt Junior High has potential to decrease peak flow rates and water surface elevations in the Troy/Purdy Lane area, where some flood prone properties are located, and to reduce peak flow rates at Vernon Street. The impact that this potential project may have on decreasing flow rates at Vernon Street may be limited in comparison with the magnitude of impact that other projects may have. However, due to few potential project sites in the Linda Creek watershed, this project may be considered as having the potential for local peak flow reduction.

H.4 Wedgewood Drive on Linda Creek

Just upstream from Wedgewood Drive on Linda Creek is a steep, narrow ravine between residential developments that could potentially be used as a flood detention project site. The surface area of the potential project site is approximately 2.5 acres that is covered by riparian vegetation and trees. The project concept would be to construct an in-channel weir, allowing low flow passage, but detaining the peak flows by

increasing the water surface elevation. Plate H.4 shows a map of the potential project area.

Based on the evaluated configuration and the SE40N@0 centering, the maximum water surface elevation would increase by 8 feet just upstream from Wedgewood Drive. This scenario would decrease peak flows by 33 cfs just downstream from Wedgewood Drive and decrease peak flows 13 cfs at Vernon Street. Table H.4 summarizes the FEMA FIS, pre- and post-potential project water surface elevations.

Table H.4 Water Surface Elevations (feet) for Locations Impacted by Potential Wedgewood Drive Project

		SE40N0			LC5A0		
Location	FEMA (Nolte)	No Project	With Project	Project Delta	No Project	With Project	Project Delta
Upstream from Wedgewood Drive	281.76	281.34	288.47	7.13	281.34	294.23	12.89
Downstream from Wedgewood Drive	279.61	277.97	277.82	-0.17	279.05	278.73	-0.32

Note: The FEMA water surface elevation is provided for reference and was not used in the analysis. It may be different from the current study model due to flow rate difference or other issues.

Chart H.9 and Chart H.10 show the flow hydrographs for the SE40N@0 centering at Wedgewood Drive and Vernon Street with and without the potential project at Wedgewood Drive.

Chart H.9 Flow Hydrograph Just Downstream from Wedgewood Drive With and Without Potential Wedgewood Drive Project

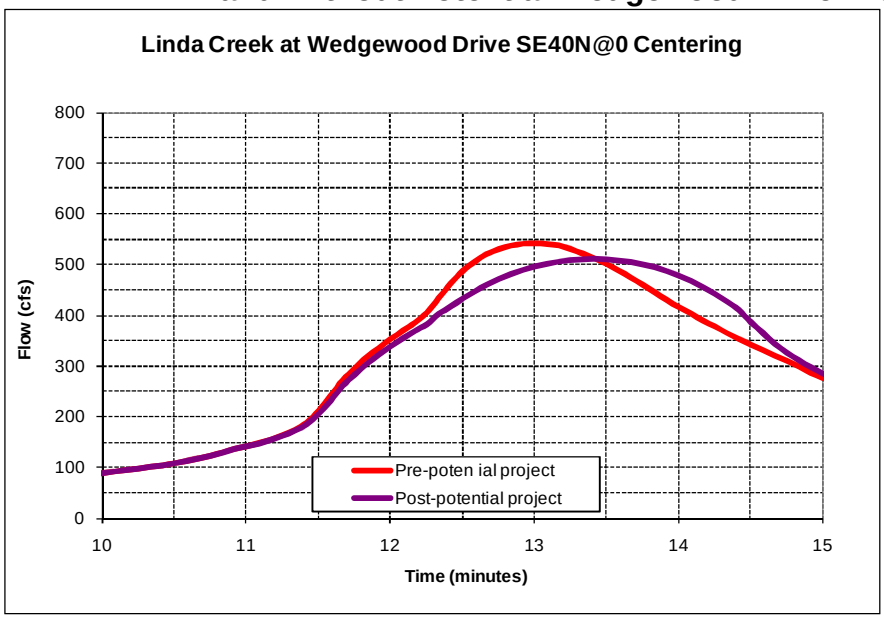
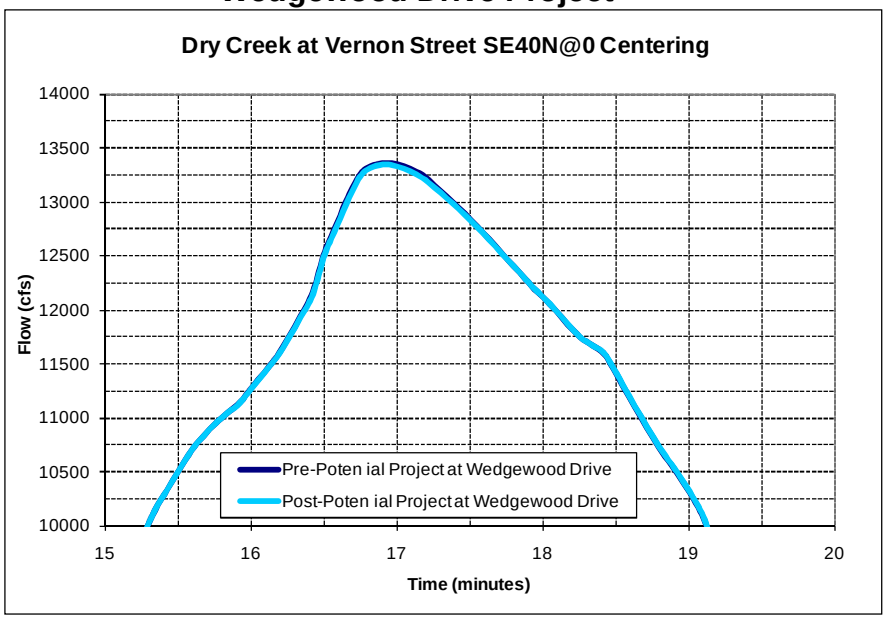


Chart H.10 Flow Hydrograph at Vernon Street With and Without Potential Wedgewood Drive Project



For the LC5A@0 centering, the project may cause the water surface elevation to increase by 13 feet just upstream from Wedgewood Drive. This scenario would reduce peak flows by 67 cfs just downstream from Wedgewood Drive and 44 cfs at Vernon Street. The 100-year water surface elevation may be able to increase by 20 feet at this location without impacting the adjacent properties. Chart H.11 and Chart H.12 show the flow hydrographs for the LC5A@0 centering at Wedgewood Drive and Vernon Street with and without the potential project.

Chart H.11 Flow Hydrograph Just Downstream from Wedgewood Drive With and Without Potential Project

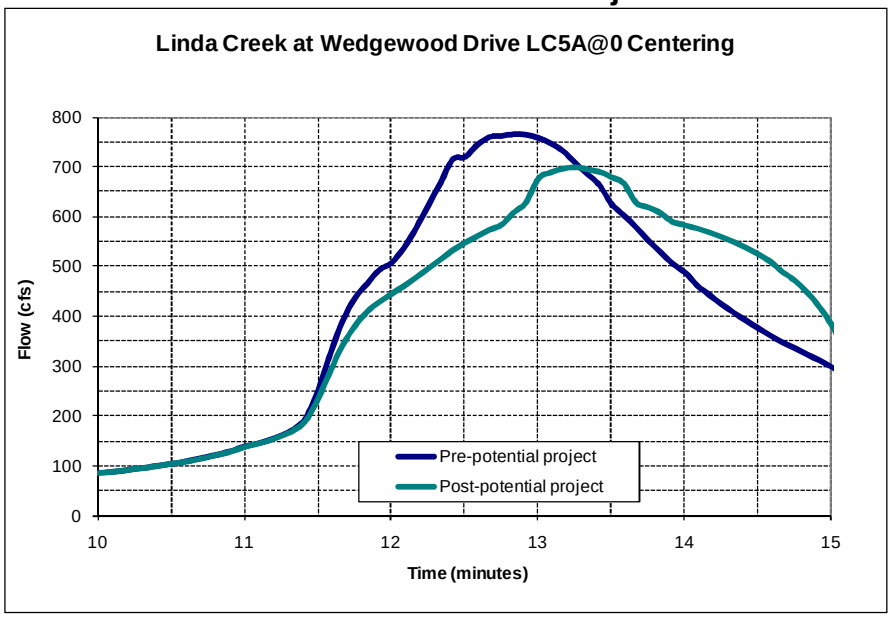
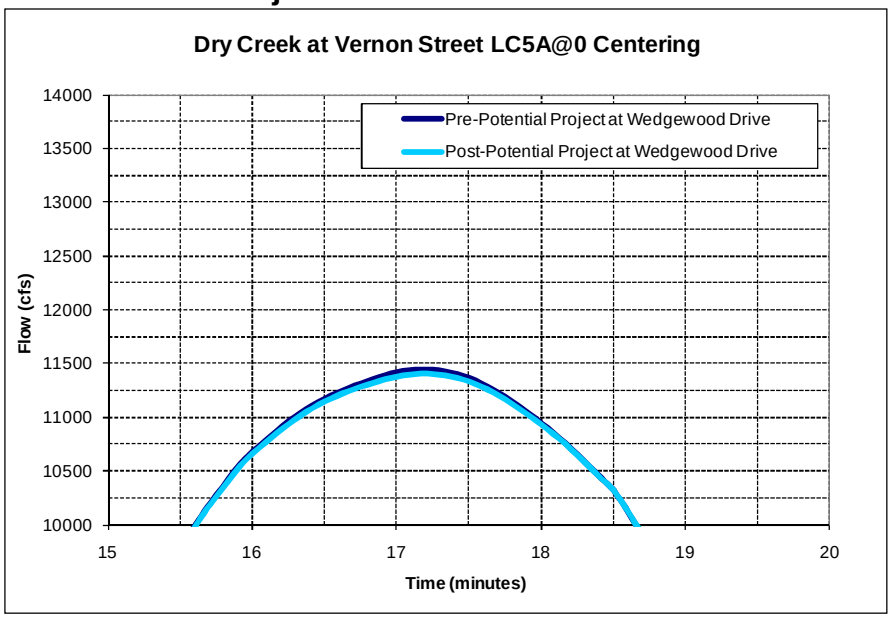


Chart H.12 Flow Hydrograph at Vernon Street With and Without Potential Project



The total weir length would be approximately 150 feet. The weir would vary in height from 0 to 16 feet and would require erosion control measures on the downstream side. The extent of the area impacted by the increased water surface extends 1,300 feet upstream from the potential weir, just downstream from the Granite Bay Golf Course. Most of the area impacted by the project site is currently floodplain.

The potential project just upstream from Wedgewood Drive on Linda Creek may provide peak flow reduction at Vernon Street. Other alternatives such as installing flow control gates on the potential weir may also be analyzed to reduce overall project costs. It is recommended that this potential project site be investigated further for a flood control project.

H.5 Atlantic Street on Antelope Creek

A potential project site is located adjacent to westbound Interstate-80, north of Atlantic Street on Antelope Creek. The potential flood detention project consists of constructing two weirs or embankments spanning the main channel that allow passage of low flows while detaining higher flows. This concept was evaluated with one weir or embankment about 200 feet upstream from the railroad bridge that runs adjacent to Atlantic Street (Phase 1) and a second weir or embankment that would replace the bicycle path bridge that is just downstream of Roseville Parkway (Phase 2). Though the project could involve either or both weirs/embankments, the analysis presented here represents the completion of both. Plate H.5 shows a map of the potential project location.

For the peak flow reduction anaylsis, Phase 1 structure was modeled as a 10-to 12-foot high embankment on the floodplain with a Conspan Arch culvert with a span of 32 feet

and a rise of 7.5 feet. The Phase 2 structure will replace the existing bike bridge, raising the bridge deck about 4 to 6 feet. An embankment or wall will tie in the crest of the new structure to existing ground to limit overtopping to the desired area. The model assumed that the two existing 6.5-foot diameter culverts will be replaced with a Conspan Arch with a span of 20 feet and a rise of 7 feet.

The total weir length would be approximately 120 feet for the downstream weir near Atlantic Street and 200 feet for the upstream weir at the bicycle bridge.

For the SE40N@0 centering, the combined effect of the weirs would reduce the calculated peak Antelope Creek flows just downstream from Atlantic Street by 446 cfs, and would reduce the peak Dry Creek flow at Vernon Street by 825 cfs. Table H.5 summarizes water surface elevations from FEMA FIS (2001), and pre- and post-potential project conditions from the model used for project analysis.

Table H.5 Water Surface Elevations (feet) for Locations Impacted by Potential Project at Atlantic Street

		SE40N0			AC5I60		
Location	FEMA (2001)	No Project	With Project	Project Delta	No Project	With Project	Project Delta
Upstream from weir near bicycle bridge	173.0	174.23	179.01	4.78	174.59	179.43	4.84
Upstream from weir near railroad bridge	165.2	165.69	169.83	4.14	166.22	170.71	4.49
Downstream from Atlantic Street	162.0	162.81	162.40	-0.41	163.39	162.85	-0.54

Note: The FEMA water surface elevation is provided for reference and was not used in the analysis. It may be different from the current study model due to flow rate difference or other issues including peak flow rates that are considerably higher in the current model than the flow rates used in the FEMA FIS.

Chart H.13 and Chart H.14 show the flow hydrographs just downstream from Atlantic Street and at Vernon Street with and without the potential project.

Chart H.13 Flow Hydrograph Just Downstream from Atlantic Street With and Without Potential Project

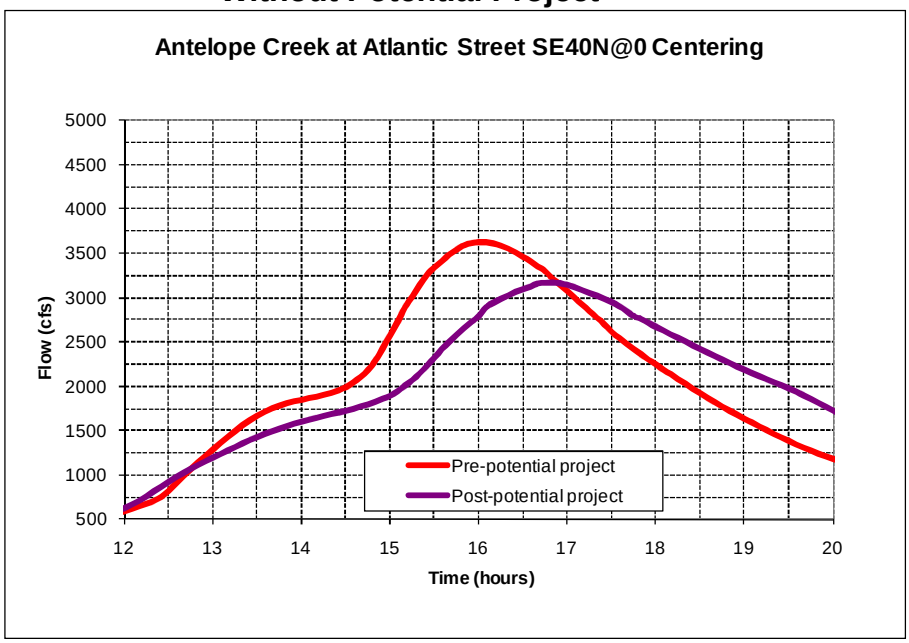
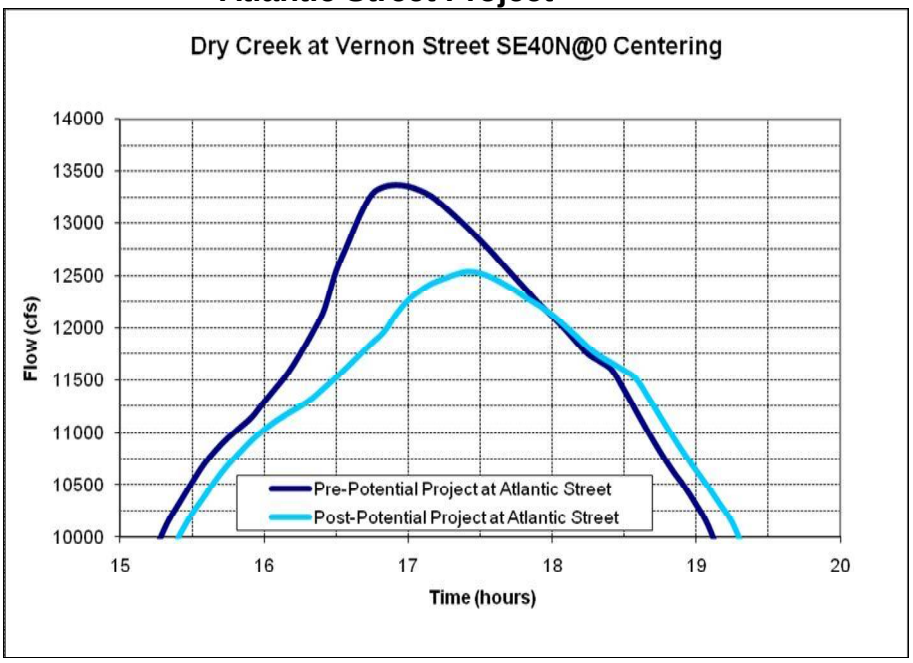


Chart H.14 Flow Hydrograph at Vernon Street With and Without Potential Atlantic Street Project



Based on the seven storm centering locations used in the analysis that cause the highest flows, the project could reduce the peak flow generated by the AC5I@60 by 323 cfs at Atlantic Street and 490 cfs at Vernon Street. Chart H.15 and Chart H.16 show the flow hydrographs just downstream from Atlantic Street and at Vernon Street with and without the potential project based on the AC5I@60 centering.

Chart H.15 Flow Hydrograph Just Downstream from Atlantic Street With and Without Potential Project

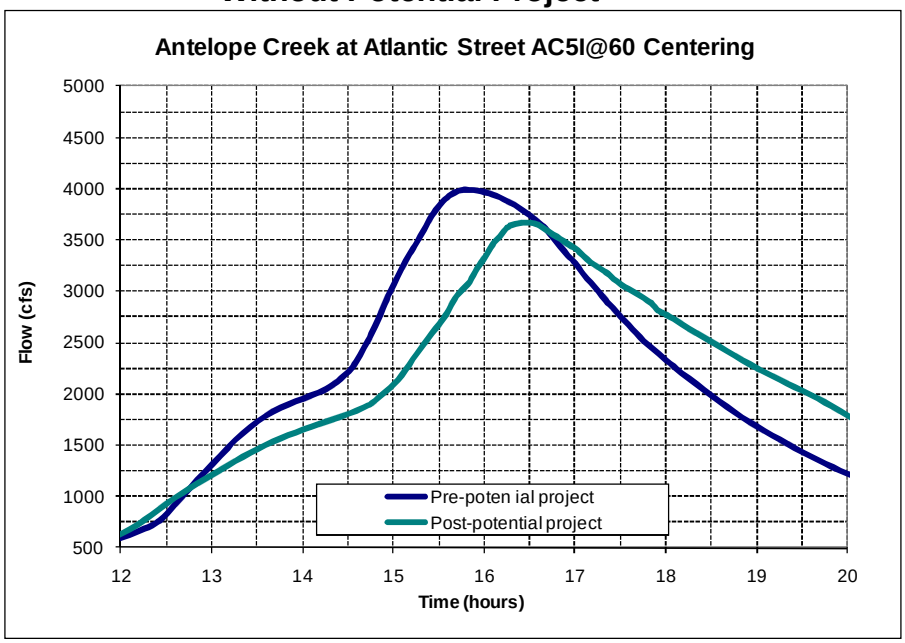
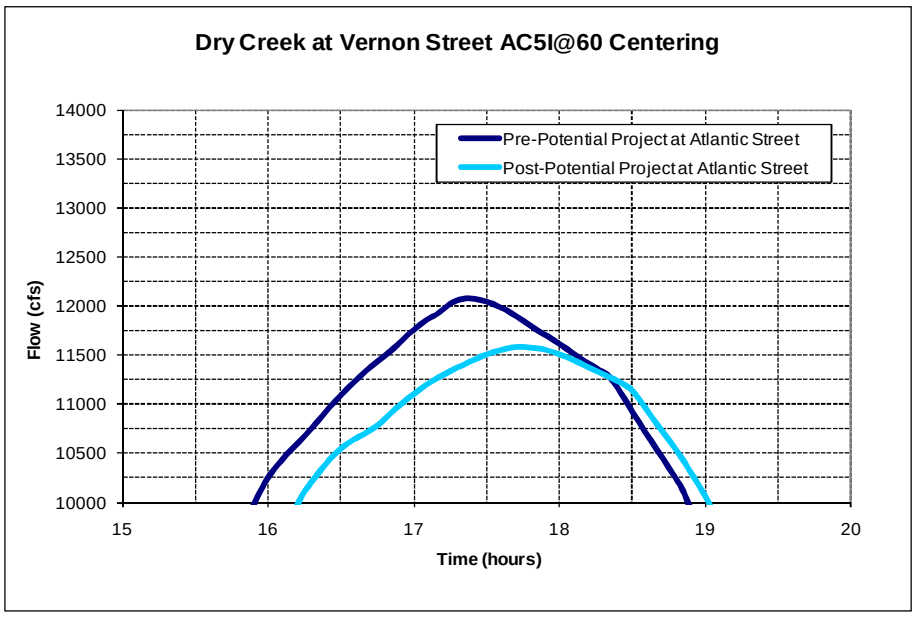


Chart H.16 Flow Hydrograph at Vernon Street With and Without Potential Atlantic Street Project



The project would require increasing the 100-year water surface elevation upstream from Atlantic Street and upstream from the bicycle path bridge to achieve the indicated benefit. It is estimated that this project would increase the 100-year floodplain area by 8.6 acres.

The majority of the project site is owned by the City of Roseville, including 5.3 of the 8.6

acres of additional area that would be included in the 100-year floodplain. A flood easement may be negotiated with the City of Roseville for areas impacted by the potential project. The extent of the area impacted by the increased water surface would extend from the weir at the bicycle bridge upstream about 5,000 feet to approximately the Highway 65 crossing over Antelope Creek.

Part of the project site is a capped landfill that has been capped. A potential project on this site, such as the weir, would require reviewing the environmental and geotechnical feasibility of construction within this area.

The potential project upstream from Atlantic Street on Antelope Creek demonstrates great potential for reducing peak flows at Vernon Street and meeting the District's peak flow mitigation goals. The District has already conducted a flood damage reduction analysis for this project to quantify the flood damage reduction benefits to be realized from this project. A detailed cost estimate is found in Section H.12.

H.6 Old Auburn Road on Linda Creek

Another potential project site just upstream (south) of Old Auburn Road on Linda Creek was previously studied by the City of Roseville for possible future development. Plate H.6 shows a map of the potential project. A portion of the site was found to be infeasible for development purposes due to the current extent of the floodplain. However, this portion of the site may be used for detention purposes by excavating additional storage volume on the left bank. This evaluation is based on excavating approximately 5,000 cubic yards of cut, and depositing it on the right bank, above the existing floodplain. This potential project would include a berm constructed along the left (west) bank to increase effective detention volume in the off-channel detention basin.

For the SE40N@0 centering, the peak flows would be reduced by 68 cfs just downstream from Old Auburn Road and 28 cfs at Vernon Street. The analysis indicates that the potential project may increase water surface elevation up to six inches just upstream from the project location. Table H.6 summarizes the FEMA FIS (2001), pre- and post-potential project conditions from the model used for project analysis.

Table H.6 Water Surface Elevations (feet) for Locations Impacted by Potential Project at Old Auburn Road

		SE40N0			LC40L@30		
Location	FEMA (Nolte)	No Project	With Project	Project Delta	No Project	With Project	Project Delta
Downstream from Old Auburn	169.0	162.98	162.88	-0.10	164.21	164.16	-0.05
Upstream from Potential Project Site	169.2	166.64	166.80	0.16	167.75	168.02	0.27

Note: The FEMA water surface elevation is provided for reference and was not used in the analysis. It may be different from the current study model due to flow rate difference

or other issues. In this case, it is likely that the LC40L@30 centering does not produce the peak 100-year flow rate. Future analysis of this project site would need to consider the centering that causes the 100-year flow rate.

Chart H.17 and Chart H.18 show the flow hydrographs for the SE40N@0 centering at Old Auburn Road and Vernon Street with and without the potential project.

Chart H.17 Flow Hydrograph Just Downstream from Old Auburn Road With and Without Potential Project

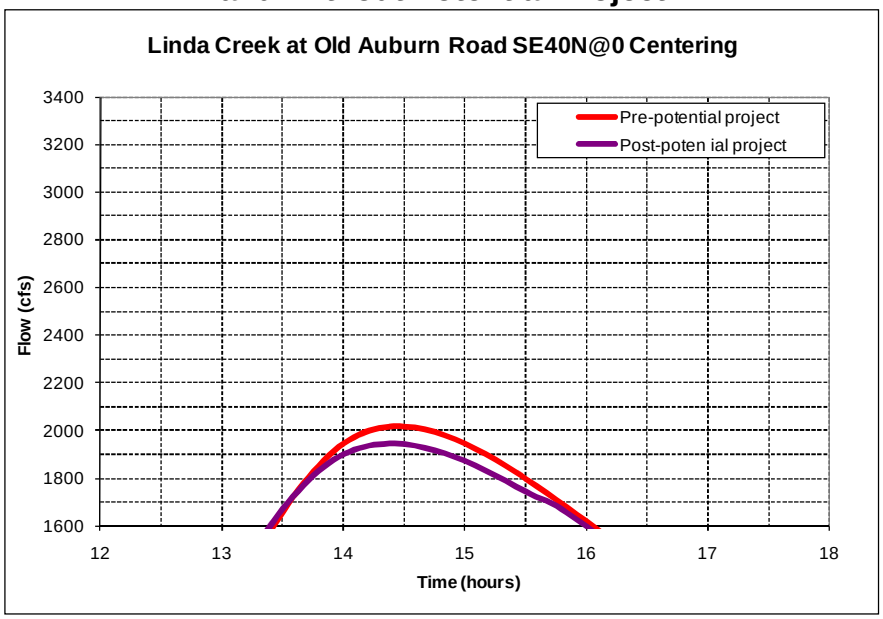
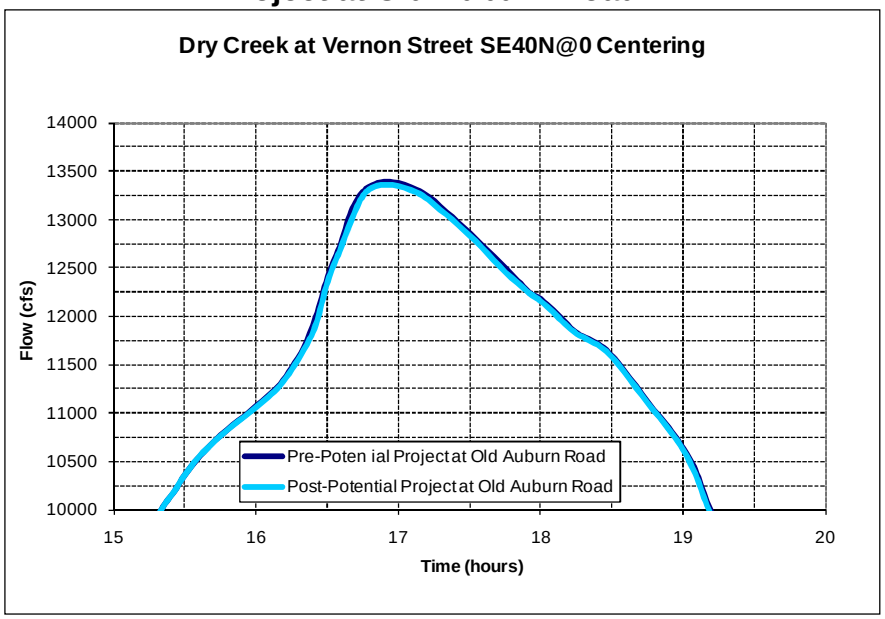


Chart H.18 Flow Hydrograph at Vernon Street With and Without Potential Project at Old Auburn Road



For the LC40L@30 centering, the peak flow reductions would be 48 cfs at Old Auburn Road and 34 cfs at Vernon Street. The analysis indicates the maximum water surface elevation increasing between eight and 10 inches, just upstream from the project site. Chart H.19 and Chart H.20 show the flow hydrographs for Linda Creek at Old Auburn Road and Dry Creek at Vernon Street for the LC40L@30 centering with and without the potential project at Old Auburn Road.

Chart H.19 Flow Hydrograph Just Downstream from Old Auburn Road With and Without Potential Project

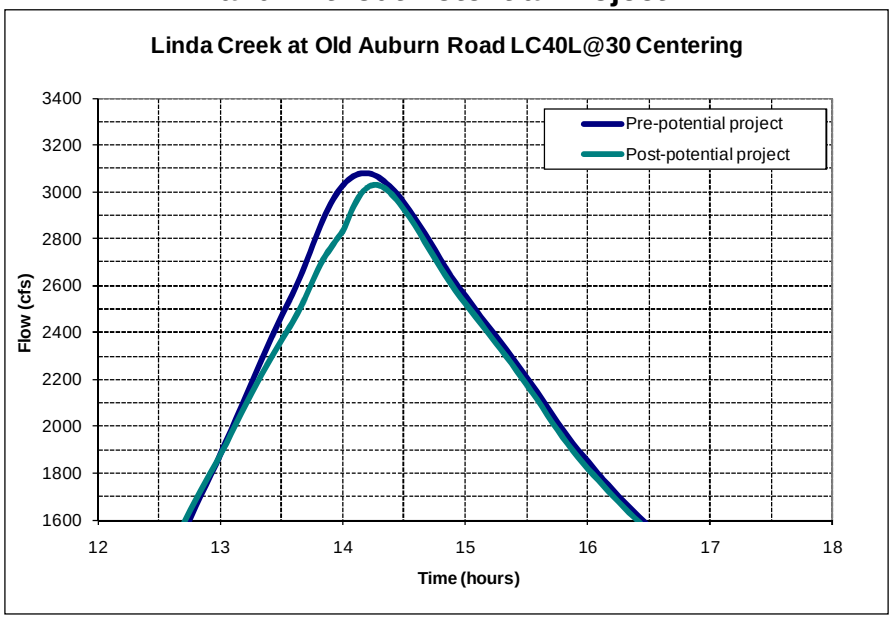
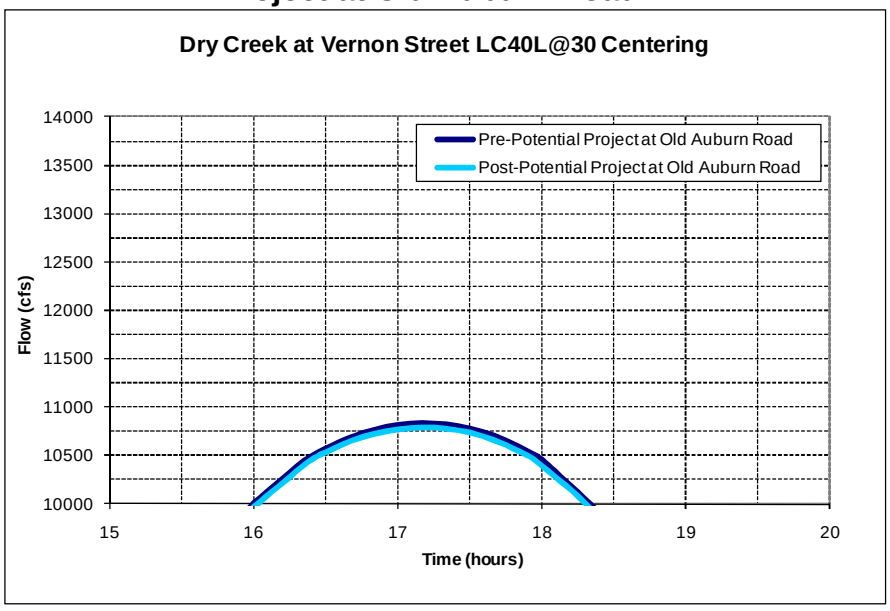


Chart H.20 Flow Hydrograph at Vernon Street With and Without Potential Project at Old Auburn Road



The project would require a berm approximately 1,000 feet in length that is

approximately four to eight feet high, depending on the natural ground. Additionally, an opening of approximately 30 feet at the upstream end of the detention basin would allow flow to enter, and a culvert with a flap gate at the downstream end of the detention basin would allow the flow to return to Linda Creek.

The potential project that was evaluated has a maximum volume of 15 acre-feet, which is less than the 50-acre-feet threshold cause it to be within DSOD jurisdiction.

More excavation may yield more peak flow reduction benefit. Also, the project may be designed to reduce potential upstream increases in water surface elevation with in-channel modifications or a different configuration of the project site.

Since the potential project site is owned by the City of Roseville, a flood easement may be negotiated for areas impacted by increased flood depths.

The Old Auburn Road on Linda Creek project site has some potential for decreasing peak flow rates at Vernon Street. It is recommended that the site be further analyzed.

H.7 West of Rocky Ridge on Linda Drive

A potential eight-acre project site is located near Sierra Gardens Drive, downstream (west) of Rocky Ridge Drive. This potential project site is already within the existing floodplain. Plate H.7 shows a map of the potential project. Existing storage volume may be added using a berm to create an off-channel detention basin, allowing higher water surface elevations within the detention basin, or by excavation. Because of the vegetative cover and the existing trees on-site, it may be difficult to create significant storage volume by excavation. The potential project only evaluated an off-channel detention basin configuration with berms.

Based on the SE40N@0 centering, peak flows immediately downstream from the project site would be decreased by 27 cfs and peak flows at Vernon Street would be decreased by nine cfs. Chart H.21 and Chart H.22 show the flow hydrographs for the SE40N@0 centering just downstream from the project site and at Vernon Street.

The site does not afford enough storage volume to effectively attenuate the large peak flows that occur lower in the watershed. This project is deemed in feasible due to potential environmental constraints and lack of peak flow reduction benefit. No further action is recommended on this project site.

Chart H.21 Flow Hydrograph Just Downstream From the Potential Project Site Near Rocky Ridge Road With and Without the Potential Project

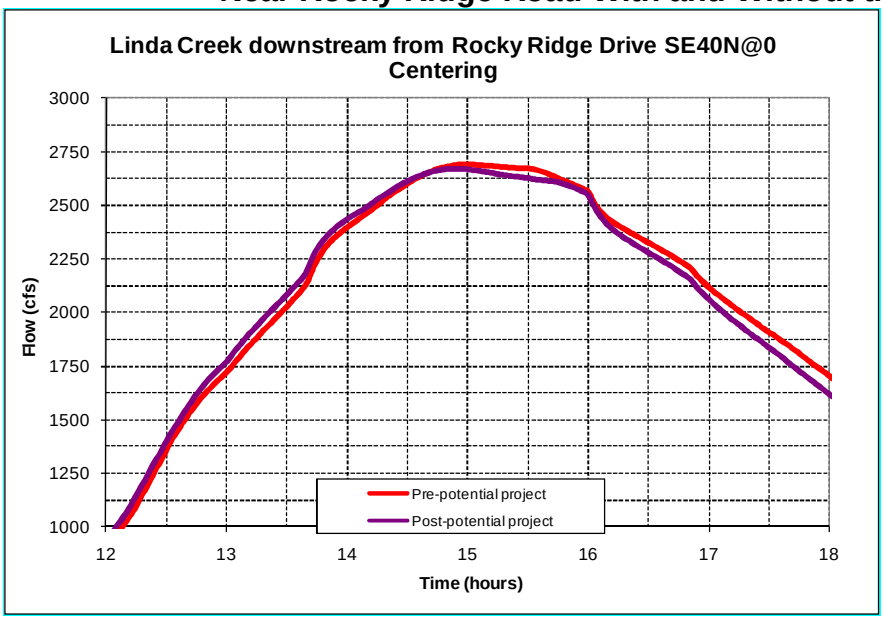
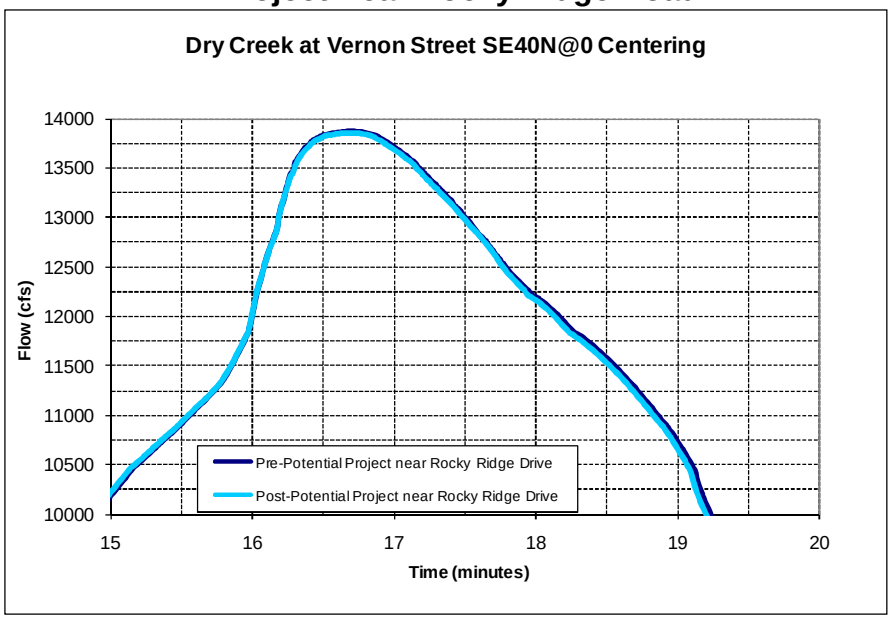


Chart H.22 Flow Hydrograph at Vernon Street With and Without Potential Project Near Rocky Ridge Road



H.8 East Roseville Parkway on Miners Ravine

A potential project site exists upstream (east) from Roseville Parkway on Miners Ravine, just downstream from the Miners Ravine Off-Channel Detention Basin. Plate H.8 shows the potential project area. The ground on the site is approximately 15 to 30 feet higher than the existing floodplain. In order for additional flood storage volume to

be added to the floodplain, at least 130,000 cubic yards of cut would have to be excavated and removed from the site before additional storage volume could be added. Due to the high costs of excavation and soil removal, this project site was deemed infeasible and not analyzed with the hydraulic model. No further action is recommended for this project site.

H.9 Sierra College Boulevard on Secret Ravine

Another potential project site is located upstream (east) from Sierra College Boulevard on Secret Ravine. Plate H.9 shows a map of the potential project location. This potential project involves construction of an in-channel weir just upstream from Sierra College Boulevard that would allow the low flows to pass, but detain the high flows. The potential project site is approximately 20 acres, of which approximately 15 acres are located within the existing floodplain. This project was evaluated for construction in 2007 using a Department of Water Resources (DWR) grant. It was determined that in order for the project to achieve the desired flood control benefit, it would require additional flood control easements and was not consistent with the terms of the available funding. Therefore, the project could not be constructed at that time. The previously proposed weir configuration was used for this analysis. Plate H.10 shows renderings of the potential weir that were created in 2007 for the feasibility study.

As noted in Section 3.9.4 modifications to raise the profile elevation of Sierra College Boulevard by about 1.6 feet were completed in 2010. Prior to construction, the peak flows overtopped Sierra College Boulevard. By increasing the top elevation, the maximum water surface elevation is increased and additional storage volume is created. Table 15 shows the impacts of the modifications to Sierra College Boulevard, including a 62 cfs peak flow reduction at Vernon Street. This potential flow reduction project evaluation was completed using a hydraulic model that included the modifications to Sierra College Boulevard.

The current study SE40N@0 centering includes much higher Secret Ravine flows than the flows considered in the 2007 project evaluation. Based on the 2007 project configuration for the SE40N@0 centering, the water surface elevation just upstream from the potential project weir would increase by 3 to 4 feet. The peak flow just downstream from Sierra College Boulevard would decrease by 68 cfs and the peak flow at Vernon Street would decrease by 175 cfs. Table H.7 summarizes the FEMA FIS (2001), pre- potential project condition, the increase in Sierra College Boulevard roadway overtopping elevation condition, and the post-potential project conditions from the model used for project analysis.

Table H.7 Water Surface Elevations (feet) Just Upstream From Potential Project Weir Near Sierra College Boulevard

		SE40N@0			SE40M@30		
Location	FEMA (2001)	No Project	With Project	Project Delta	No Project	With Project	Project Delta
Upstream from Potential Project Weir	299.4	300.92	304.28	3.36	301.50	304.68	3.18

Note: The FEMA water surface elevation is provided for reference and was not used in the analysis. It may be different from the current study model due to flow rate difference or other issues. The Secret Ravine centerings cause higher flow rates than those used in the FEMA FIS.

Chart H.23 and Chart H.24 show the flow hydrographs for the SE40N@0 centering for Sierra College Boulevard and Vernon Street with and without the potential project

.

Chart H.23 Flow Hydrographs for Secret Ravine at Sierra College Boulevard With and Without the Potential Project – Vernon Peak Flow Centering

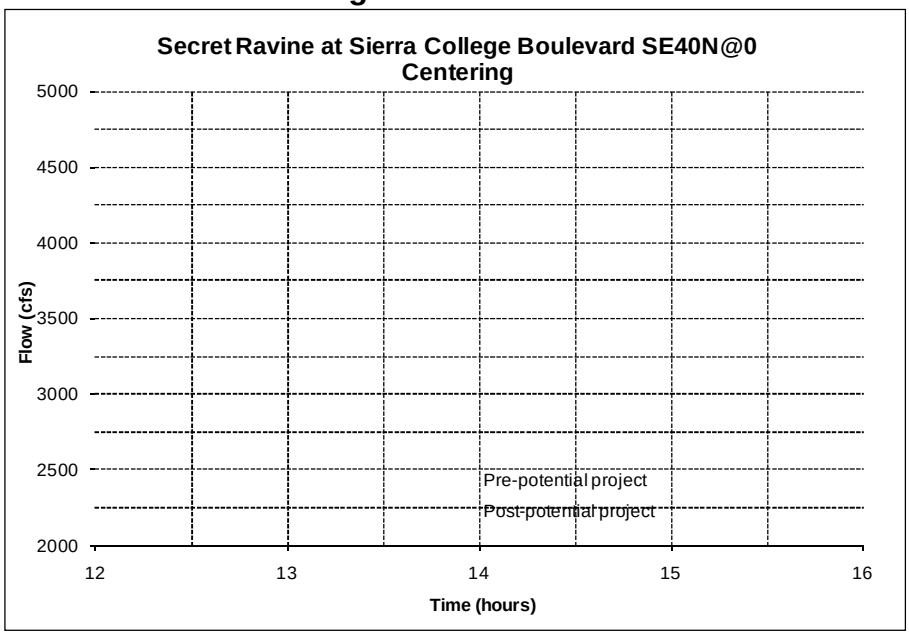
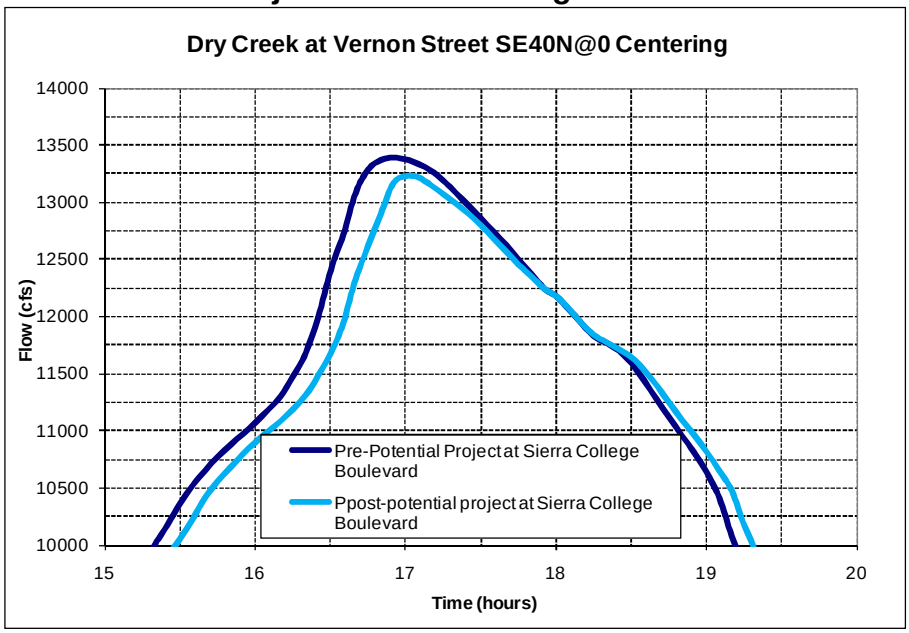


Chart H.24 Flow Hydrographs at Vernon Street With and Without Potential Project at Sierra College Boulevard – Vernon Peak Flow Centering



For the SE40M30 centering, the peak flow rates at Sierra College Boulevard and Vernon Street would be decreased by 57 cfs and 188 cfs, respectively, considering the new roadway elevation and the potential in-channel weir. Chart H.25 and Chart H.26 show the flow hydrographs for the SE40M@0 centering for Sierra College Boulevard and Vernon Street with and without the potential project.

Chart H.25 Flow Hydrographs for Secret Ravine at Sierra College Boulevard With and Without the Potential Project – Local Peak Flow Centering

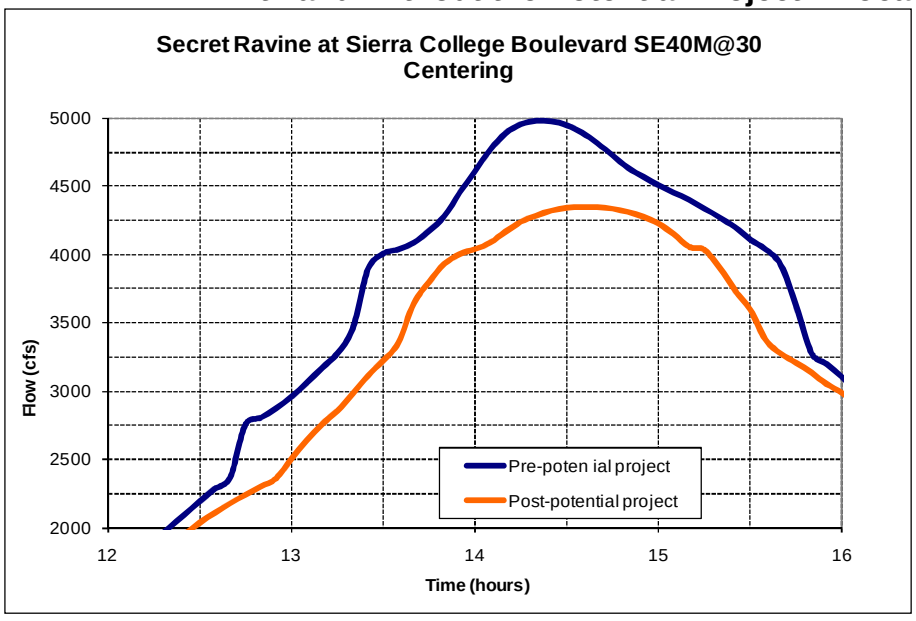
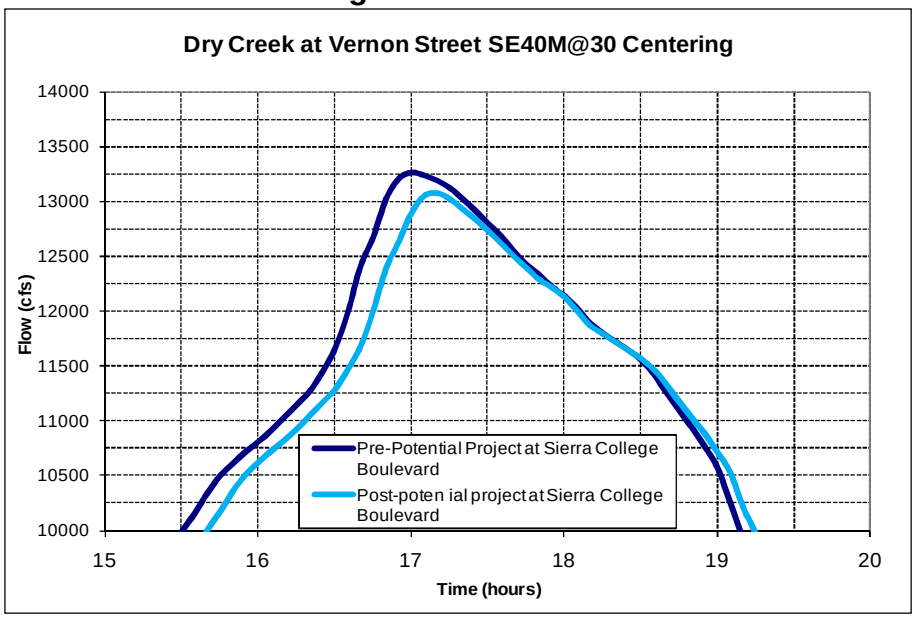


Chart H.26 Flow Hydrographs at Vernon Street before and after Sierra College Boulevard With and Without the Potential Project – Local Peak Flow Centering



The impact of the project extends about 3,000 feet upstream. The potential project weir would be approximately 450 feet wide and 0 to 15 feet tall, depending on the natural ground height. About five acres of developable land (outside of the existing floodplain) would need to be acquired for the potential project. The other 15 acres impacted by the project are in the existing floodplain and would also require a flood easement or fee title.

This project has the potential for reducing peak flow rates at Vernon Street. Further study is recommended for this project site.

H.10 McLaren Drive at Maidu Park on Strap Ravine

One potential project site is located in Maidu Park on Strap Ravine, just upstream (north) of McLaren Drive. The potential project would involve constructing an in-channel structure that allows low flow passage, but detains higher flows, increasing the upstream water surface elevation for the peak flows, and attenuating the peak flow from the project site. Plate H.11 shows a map of the potential project site.

Based on the SE40N@0 centering, the maximum water surface elevation in Maidu Park would increase by three feet. The peak flow just downstream from McLaren Drive would be reduced by 156 cfs. However, the peak flow at Vernon Street would increase by 35 cfs. Without the project, the peak flow on Strap Ravine occurs about one hour before the peak flow on Linda Creek, just upstream from the Strap-Linda confluence. Delaying the peak on Strap Ravine would cause the peak to align with the peak Linda Creek flow, producing a net increase in peak flow rate downstream from the confluence and at Vernon Street. Chart H.27 and Chart H.28 show the flow hydrographs for

SE40N@0 centering at McLaren Drive and Vernon Street.

Chart H.27 Flow Hydrograph at McLaren Drive With and Without a Potential Project Upstream from McLaren Drive

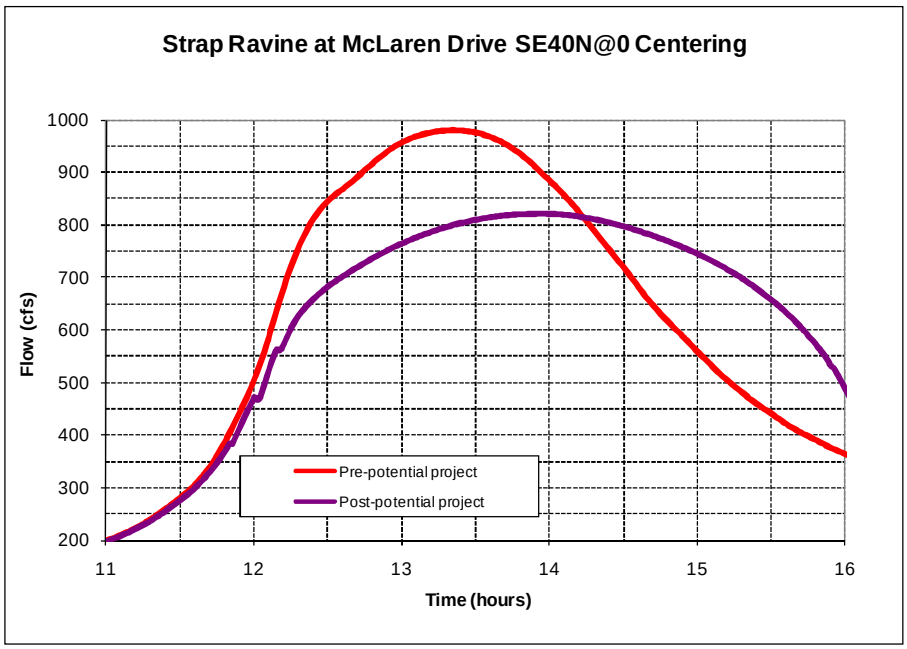
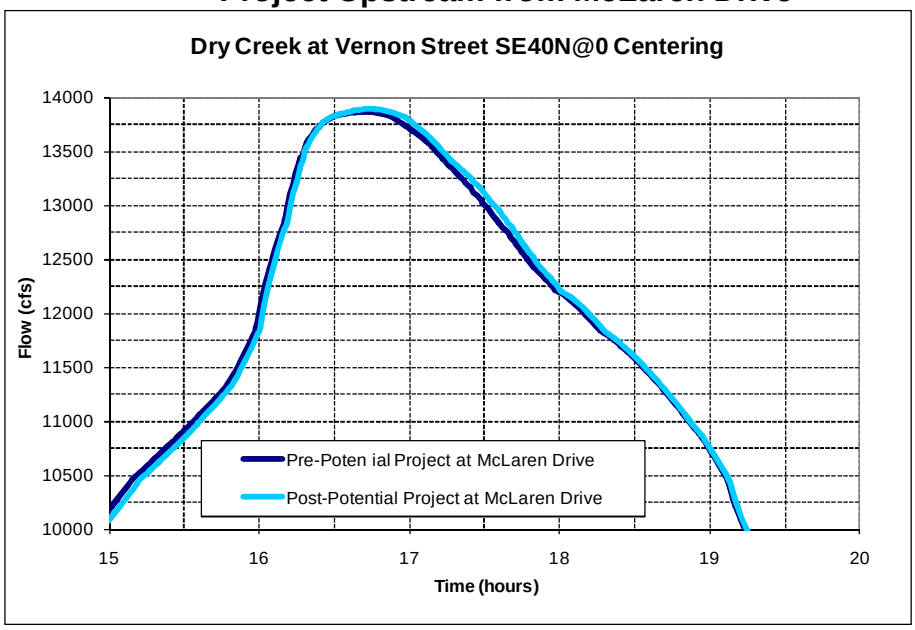


Chart H.28 Flow Hydrograph at Vernon Street With and Without a Potential Project Upstream from McLaren Drive



The project is deemed infeasible due to the net increase of peak flows at Vernon Street. No further action is recommended for this potential project site.

H.11 Vista Oaks Area on Secret Ravine

As part of the development plan for the Vista Oaks area, downstream (south) of China Garden on Secret Ravine, an opportunity exists for a potential flood control and creek restoration project as part of the development. The potential project implements an in-channel weir with low flow passage and detains high flows. Plate H.12 shows a map of the potential project area.

For the SE40N@0 centering, the evaluated potential project would decrease local peak flows by 103 cfs, but would not cause any net change at Vernon Street. Any decrease and delay in peak flow on the lower part of Secret Ravine is counteracted by the rising limb of the Miners Ravine hydrograph, causing no net impact at Vernon Street. Chart H.29 and Chart H.30 show the flow hydrographs for downstream from the potential Vista Oaks project site and Vernon Street with and without the potential project.

Chart H.29 Flow Hydrograph Just Downstream from Vista Oaks With and Without a Potential Project at Vista Oaks

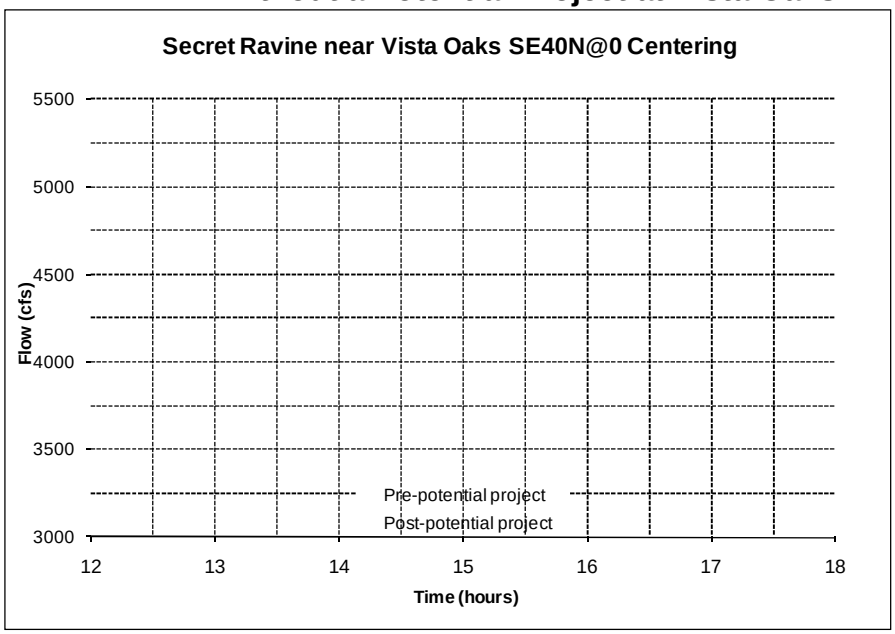
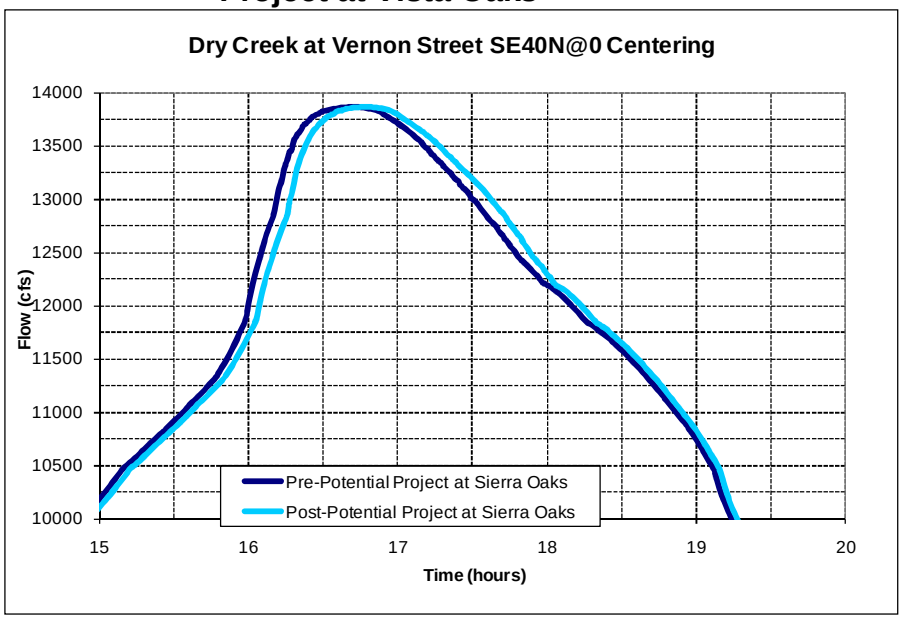


Chart H.30 Flow Hydrograph at Vernon Street with and without a Potential Project at Vista Oaks



A local stream restoration project may be feasible but would offer no additional regional flood control benefits beyond local peak flow reduction, based on the SE40N@0 centering. No further action is recommended for this potential project site.

H.12 Potential Project Cost Estimates

The cost estimates for the five recommended potential projects (Antelope Creek at Atlantic Street Phase 1 and Phase 2, Linda Creek near Auburn-Folsom Road, Linda Creek near Wedgewood Drive, Linda Creek at Old Auburn Road, and Secret Ravine at Sierra College Boulevard) are included in Tables H.8-H.12.

Table H.8 Cost Estimate for Project on Antelope Creek at Atlantic Street

Project:	**Antelope Creek at Atlantic Street Phase 1**			
Item	**Quantity**	**Unit**	**Unit Cost**	**Total Cost**
Con-Span Arch Phase 1 (Span: 32', Rise 7.5', Length 42')	1	LS	$ 200,000	$ 200,000
Reinforced Concrete Footings	30	CY	$ 800	$ 24,000
Excavation (Includes Placement as Fill)	8,000	CY	$ 20	$ 160,000
Asphalt Paving (For Weir Crest)	5,000	SF	$ 10	$ 50,000
Heavy Duty Turf Reinforcement Mat	2,500	SY	$ 10	$ 25,000
Rip-rap Slope Protection	2,000	CY	$ 100	$ 200,000
ALERT stream level and precip gages	2	EA	$ 12,500	$ 25,000
Subtotal Phase 1 Base Construction				*$ 684,000*
Mobilization (10%)				$ 68,400

Project:	Antelope Creek at Atlantic Street Phase 1			
Item	**Quantity**	**Unit**	**Unit Cost**	**Total Cost**
Restoration Component (20%)				$ 136,800
Geotechnical (15%)				$ 102,600
Construction Management (10%)				$ 68,400
Contingency (15%)				$ 102,600
Administration (10%)				$ 68,400
Engineering				
Hydraulic Design Calculations				$ 26,000
Structural Design				$ 40,000
Civil Plans and Specifications				$ 70,000
Land Acquisition	3	AC	$ 55,555	$ 166,665
Mitigation and Permitting				$ 170,000
Total Phase 1				***$ 1,664,000***

Project:	Antelope Creek at Atlantic Street Phase 2			
Item	**Quantity**	**Unit**	**Unit Cost**	**Total Cost**
Con-Span Arch Phase 2 (Span: 20', Rise 7', Length 40')	1	LS	$ 150,000	$ 150,000
Reinforced Concrete Footings	25	CY	$ 800	$ 20,000
Excavation (Includes Placement as Fill)	3,000	CY	$ 20	$ 60,000
Bicycle Path Paving	4,000	SF	$ 10	$ 40,000
Heavy Duty Turf Reinforcement Mat	1,500	SY	$ 10	$ 15,000
Rip-rap Slope Protection	1,500	CY	$ 100	$ 150,000
Miscellaneous	1	LS	$ 100,000	$ 100,000
Subtotal Phase 2 Base Construction				*$ 535,000*
Mobilization (10%)				$ 53,500
Restoration Component (20%)				$ 107,000
Geotechnical (15%)				$ 80,250
Construction Management (10%)				$ 53,500
Contingency (15%)				$ 80,250
Administration (10%)				$ 53,500
Engineering				
Hydraulic Design Calculations				$ 26,000
Structural Design				$ 40,000
Civil Plans and Specifications				$ 70,000
Land Acquisition	7	AC	$ 55,555	$ 388,885
Mitigation and Permitting				$ 175,000
Total Phase 2				***$ 1,623,000***
Total Phase 1 and Phase 2				**$ 3,367,000**

Table H.9 Cost Estimate for Project on Linda Creek near Auburn-Folsom Road

Project :	**Linda Creek near Auburn-Folsom Road**			
Item	**Quantity**	**Unit**	**Unit Cost**	**Total Cost**
Excavation	0	CY	$ 10	$ -
Hauling	0	CY	$ 15	$ -
Fill for Berms	2,700	CY	$ 10	$ 27,000
Grading for Berms	2,700	CY	$ 25	$ 67,500
Erosion Control for Berms	16,000	SY	$ 5	$ 80,000
Outlet	1	LS	$ 15,000	$ 15,000
Subtotal Base Construction				*$ 189,500*
Mobilization (10%)				$ 18,950
Restoration Component (20%)				$ 37,900
Geotechnical (15%)				$ 28,425
Construction Management (10%)				$ 18,950
Contingency (25%)				$ 47,375
Administration (10%)				$ 18,950
Engineering				
Hydraulic Design Calculations				$ 30,000
Structural Design				$ 4,000
Civil Plans and Specifications				$ 90,000
Land Acquisition	7	AC	$ 55,555	$ 388,885
Mitigation and Permitting				$ 135,000
Total				***$ 1,008,000***

Table H.10 Cost Estimate for Project on Linda Creek at Wedgewood Drive

Project :	Linda Creek at Wedgewood Drive			
Item	**Quantity**	**Unit**	**Unit Cost**	**Total Cost**
Wall Excavation	480	CY	$ 90	$ 43,200
Hauling	480	CY	$ 15	$ 7,200
Grading	300	CY	$ 25	$ 7,500
Reinforced Concrete Weir	150	LF	$ 2,000	$ 300,000
Rip-rap	38	CY	$ 100	$ 3,750
Subtotal Base Construction				*$ 361,650*
Mobilization (10%)				$ 36,165
Restoration Component (20%)				$ 72,330
Geotechnical (15%)				$ 54,248
Construction Management (10%)				$ 36,165
Contingency (25%)				$ 90,413
Administration (10%)				$ 36,165
Engineering				
Hydraulic Design Calculations				$ 26,000
Structural Design				$ 35,000
Civil Plans and Specifications				$ 40,000
Land Acquisition	3	AC	$ 55,555	$ 166,665
Mitigation and Permitting				$ 64,000
Total				***$ 1,019,000***

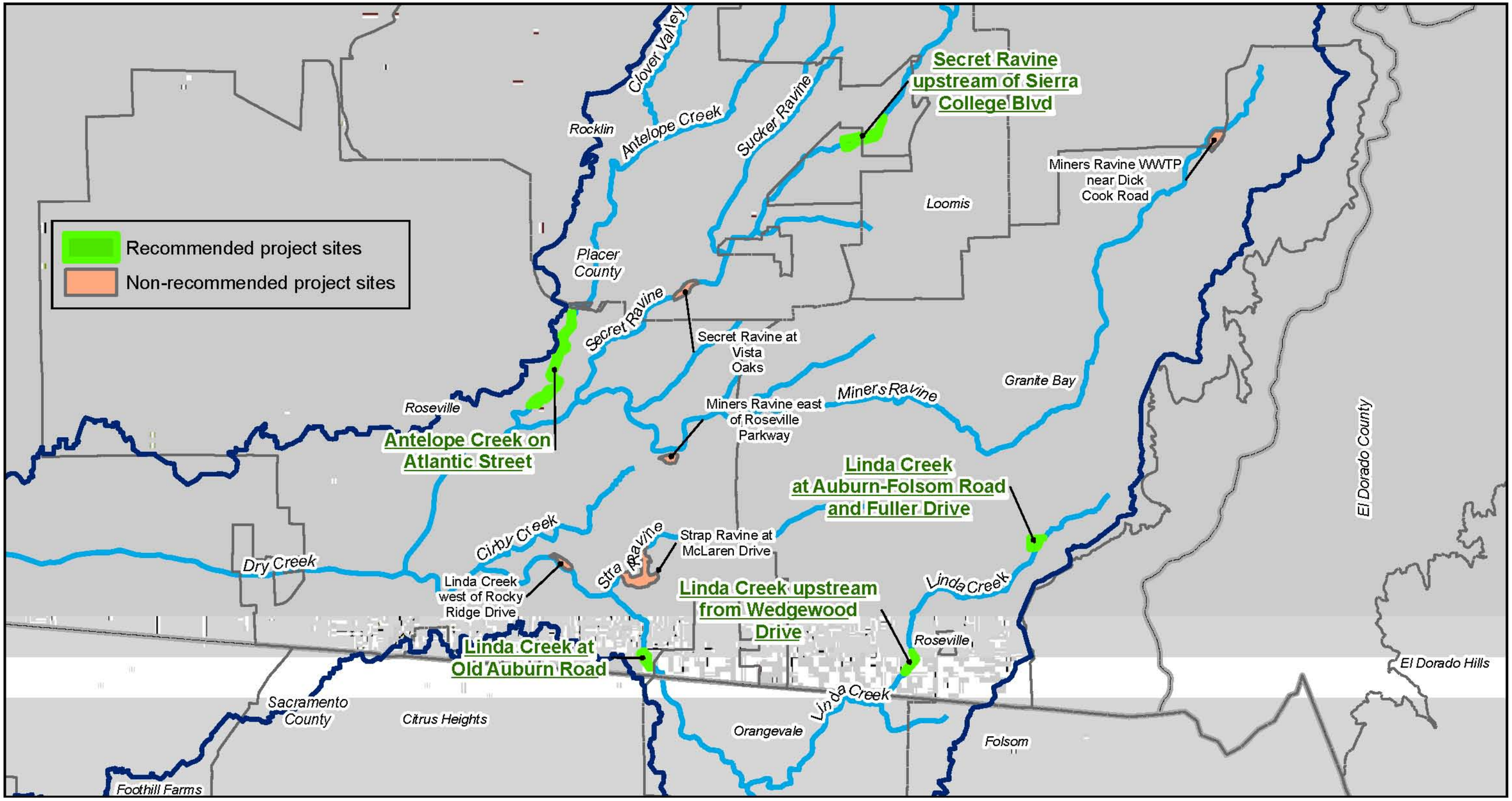
Table H.11 Cost Estimate for Project on Linda Creek at Old Auburn Road

Project :	Linda Creek at Old Auburn Road			
Item	**Quantity**	**Unit**	**Unit Cost**	**Total Cost**
Excavation	1,900	CY	$ 10	$ 19,000
Hauling	600	CY	$ 15	$ 9,000
Grading for Berms	2,500	CY	$ 25	$ 62,500
Erosion Control for Berms	16,800	SY	$ 5	$ 84,000
Outlet	1	LS	$ 15,000	$ 15,000
Subtotal Base Construction				*$ 189,500*
Mobilization (10%)				$ 18,950
Restoration Component (20%)				$ 37,900
Geotechnical (15%)				$ 28,425
Construction Management (10%)				$ 18,950
Contingency (25%)				$ 47,375
Administration (10%)				$ 18,950
Engineering				
Hydraulic Design Calculations				$ 30,000
Structural Design				$ 4,000
Civil Plans and Specifications				$ 90,000
Land Acquisition	5	AC	$ 55,555	$ 277,775
Mitigation and Permitting				$ 170,000
Total				***$ 932,000***

Table H.12 Cost Estimate for Project on Secret Ravine at Sierra College Boulevard

Project :	Secret Ravine at Sierra College Boulevard			
Item	**Quantity**	**Unit**	**Unit Cost**	**Total Cost**
Wall Excavation	800	CY	$ 90	$ 72,000
Hauling	800	CY	$ 15	$ 12,000
Grading	100	CY	$ 25	$ 2,500
Reinforced Concrete Weir	400	LF	$ 2,000	$ 800,000
Rip-rap	100	CY	$ 100	$ 10,000
Subtotal Base Construction				*$ 896,500*
Mobilization (10%)				$ 89,650
Restoration Component (20%)				$ 179,300
Geotechnical (15%)				$ 134,475
Construction Management (10%)				$ 89,650
Contingency (25%)				$ 224,125
Administration (10%)				$ 89,650
Engineering				
Hydraulic Design Calculations				$ 55,000
Structural Design				$ 55,000
Civil Plans and Specifications				$ 90,000
Land Acquisition	20	AC	$ 55,555	$ 1,111,100
Mitigation and Permitting				$ 220,000
Total				***$ 3,234,000***

DRY CREEK WATERSHED POTENTIAL REGIONAL DETENTION PROJECTS



PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

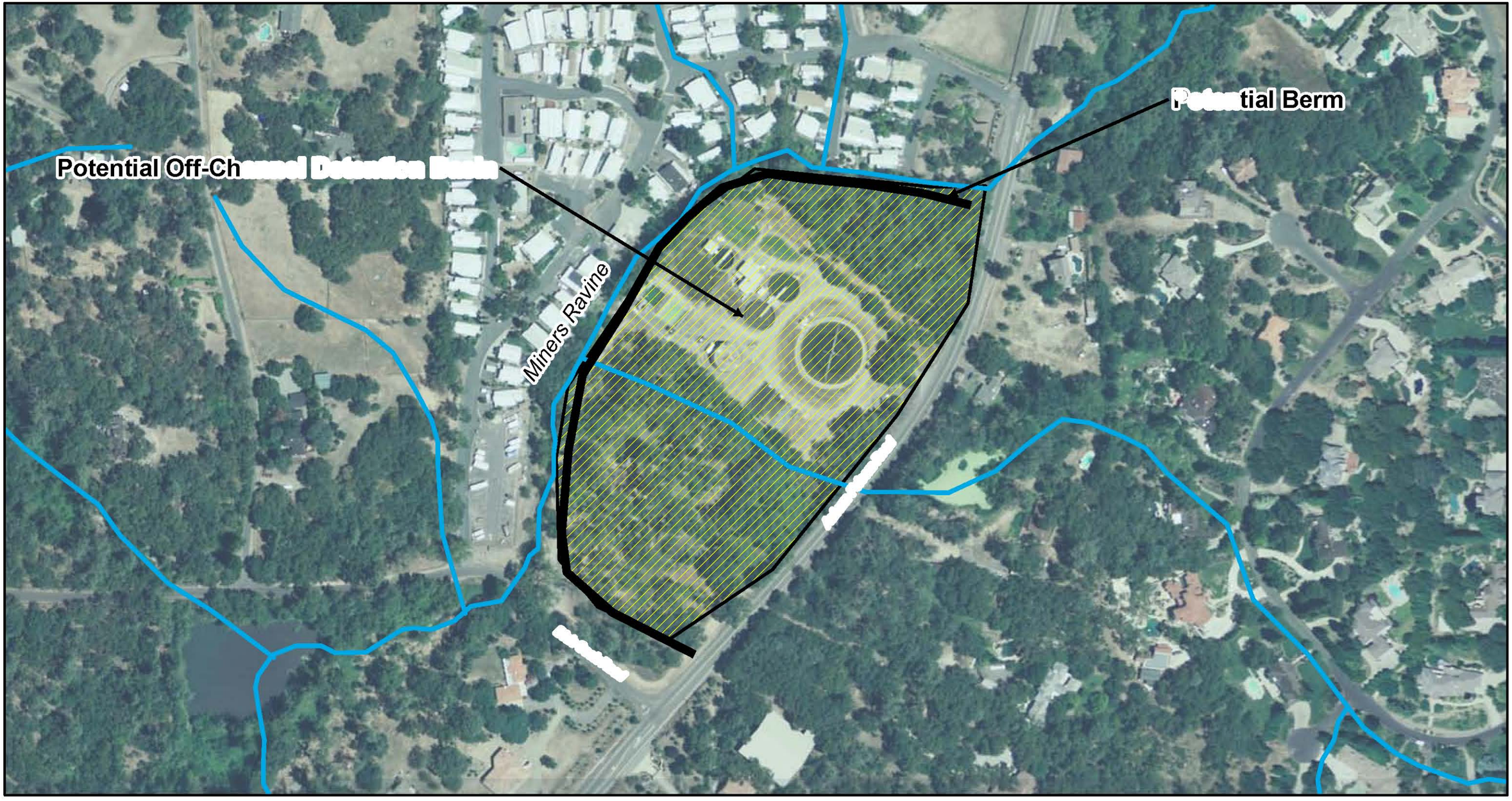
RBF CONSULTING | CIVIL ENGINEERING SOLUTIONS, INC.

0 0.5 1 Miles

1 inch = 1 mile

PLATE H1

MINERS RAVINE UPSTREAM FROM DICK COOK ROAD



PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

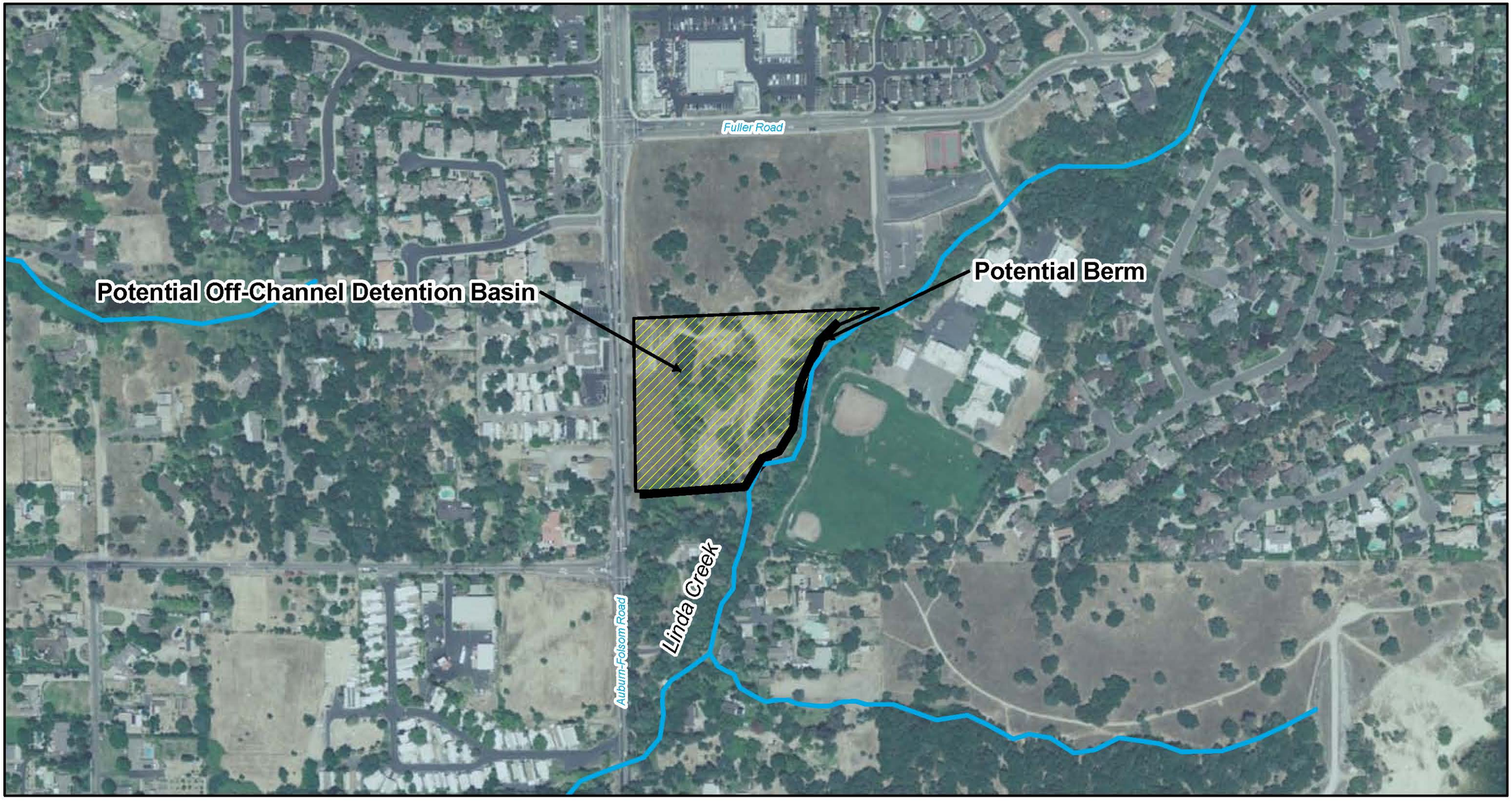
RBF CONSULTING | CIVIL ENGINEERING SOLUTIONS, INC.

0 50 100 200 Feet

1 inch = 200 feet

PLATE H2

LINDA CREEK UPSTREAM FROM AUBURN-FOLSOM ROAD



PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

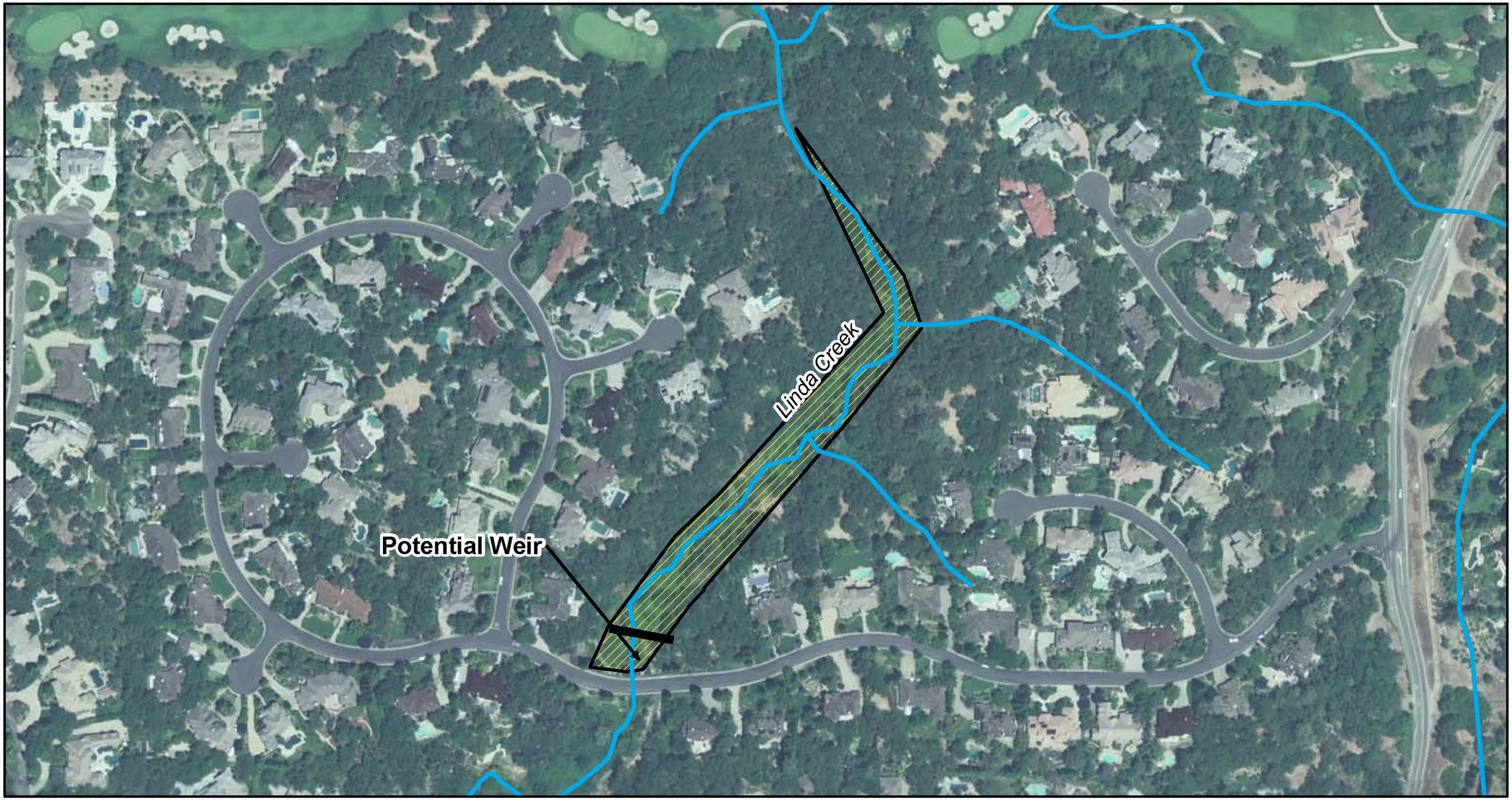
RBF CONSULTING | CIVIL ENGINEERING SOLUTIONS, INC.

0 100 200 300 Feet

1 inch = 300 feet

PLATE H3

LINDA CREEK UPSTREAM FROM WEDGEWOOD DRIVE



PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

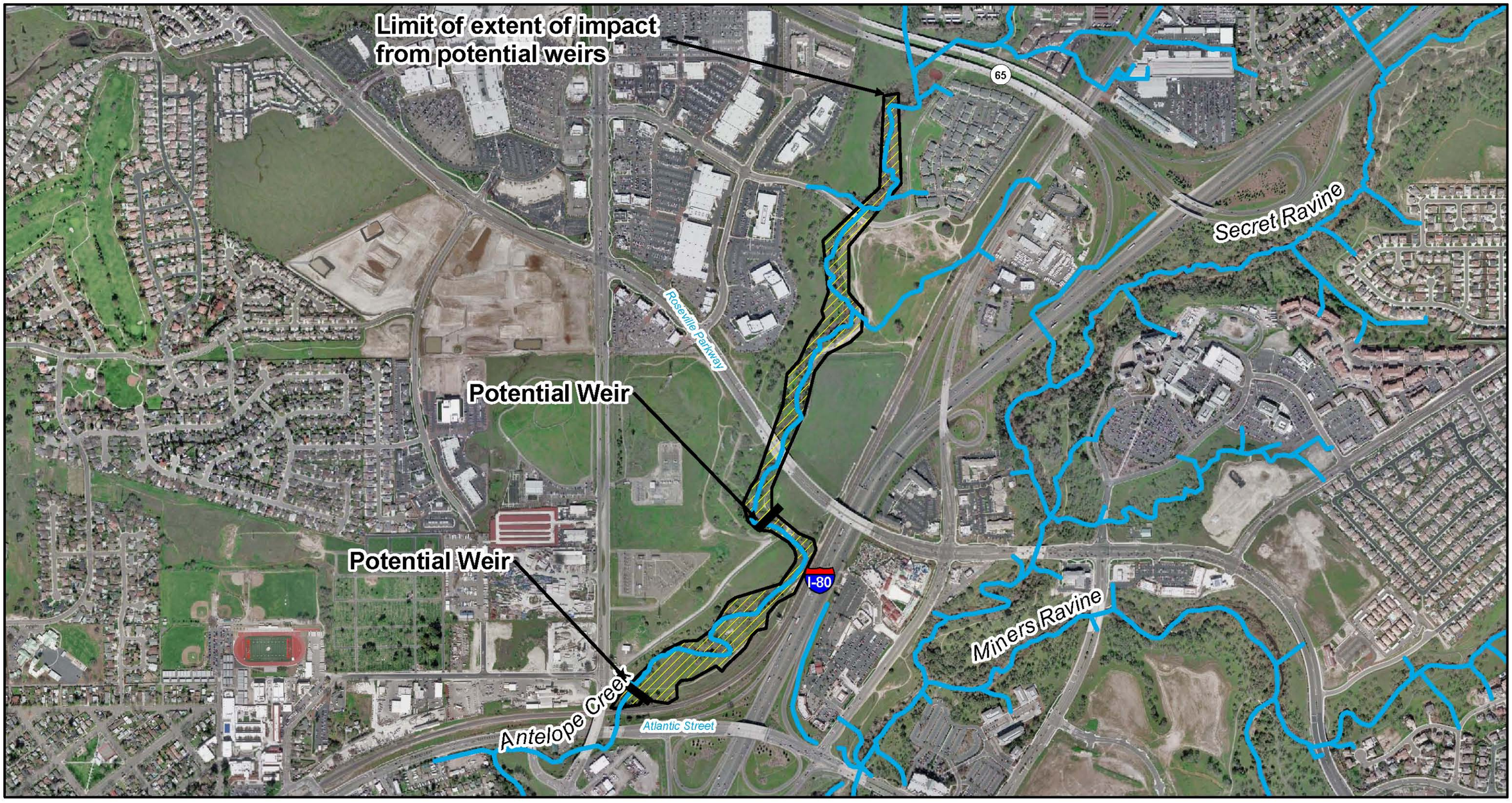
RBF CONSULTING | CIVIL ENGINEERING SOLUTIONS, INC.

0 100 200 Feet

1 inch = 200 feet

PLATE H4

ANTELOPE CREEK UPSTREAM FROM ATLANTIC STREET



PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

RBF CONSULTING | CIVIL ENGINEERING SOLUTIONS, INC.

0 400 800 1,200 Feet

1 inch = 800 feet

PLATE H5

LINDA CREEK UPSTREM FROM OLD AUBURN ROAD

PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

RBF CONSULTING

CIVIL ENGINEERING SOLUTIONS, INC.

0 150 300 Feet

1 inch = 150 feet

PLATE H6

LINDA CREEK NEAR ROCKY RIDGE DRIVE

PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

RBF CONSULTING

CIVIL ENGINEERING SOLUTIONS, INC.

0 150 300 Feet

1 inch = 300 feet

PLATE H7

MINERS RAVINE UPSTREAM FROM EAST ROSEVILLE PARKWAY

PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

RBF CONSULTING

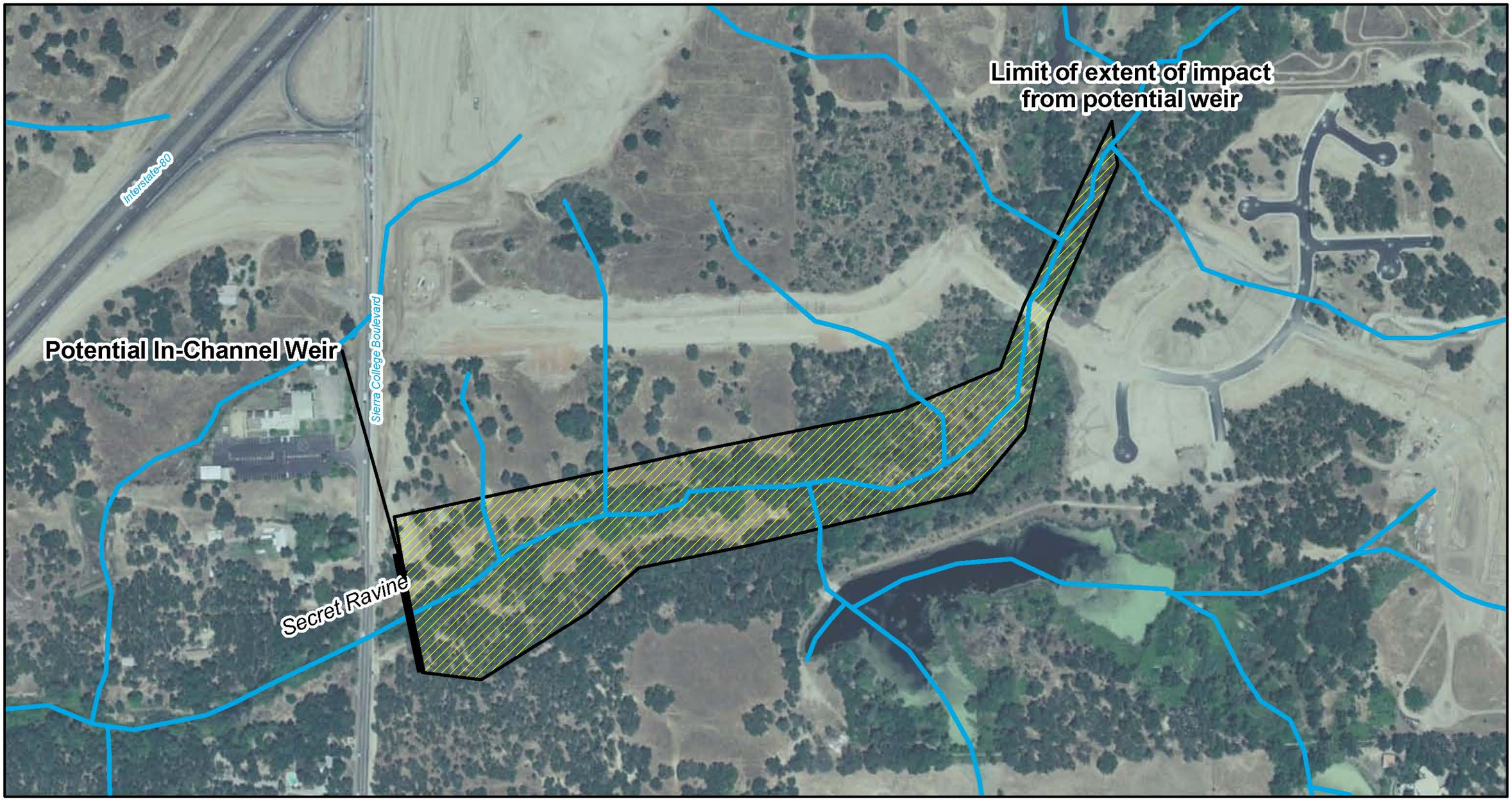
CIVIL ENGINEERING SOLUTIONS, INC.

0 150 300 Feet

1 inch = 300 feet

PLATE H8

SECRET RAVINE UPSTREAM FROM SIERRA COLLEGE BOULEVARD



PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

RBF CONSULTING

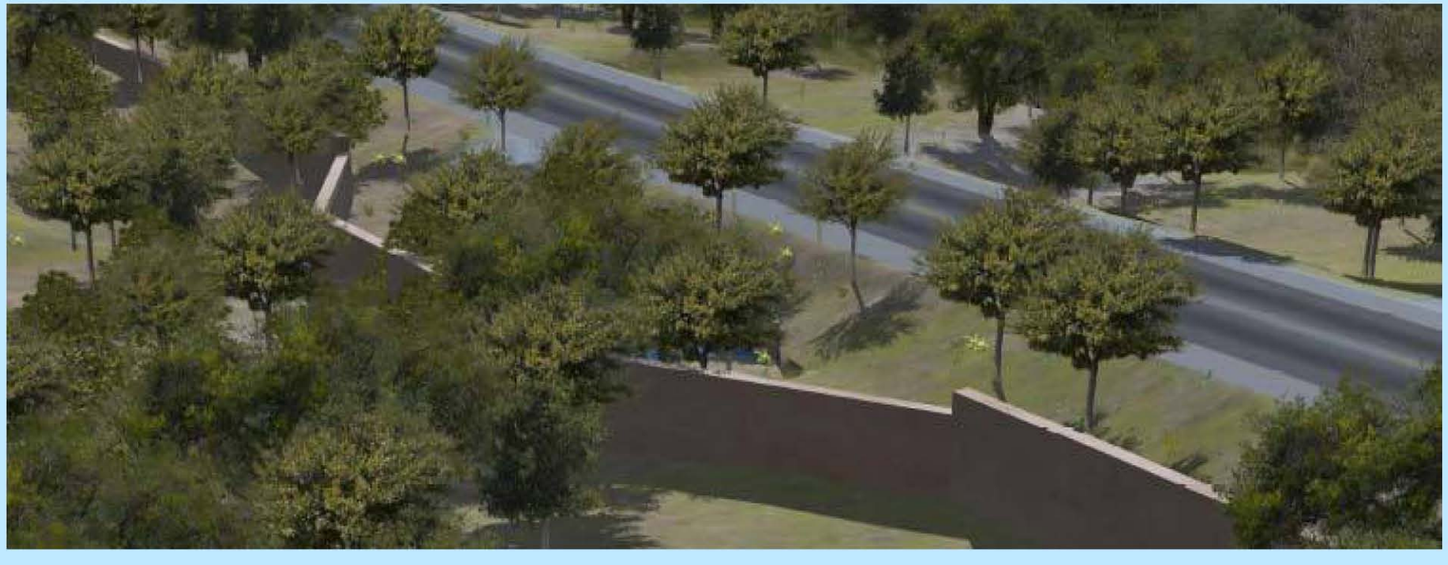
CIVIL ENGINEERING SOLUTIONS, INC.

0 300 600 Feet

1 inch = 300 feet

PLATE H9

RENDERINGS OF POTENTIAL WEIR AT SIERRA COLLEGE BOULEVARD ON SECRET RAVINE



PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

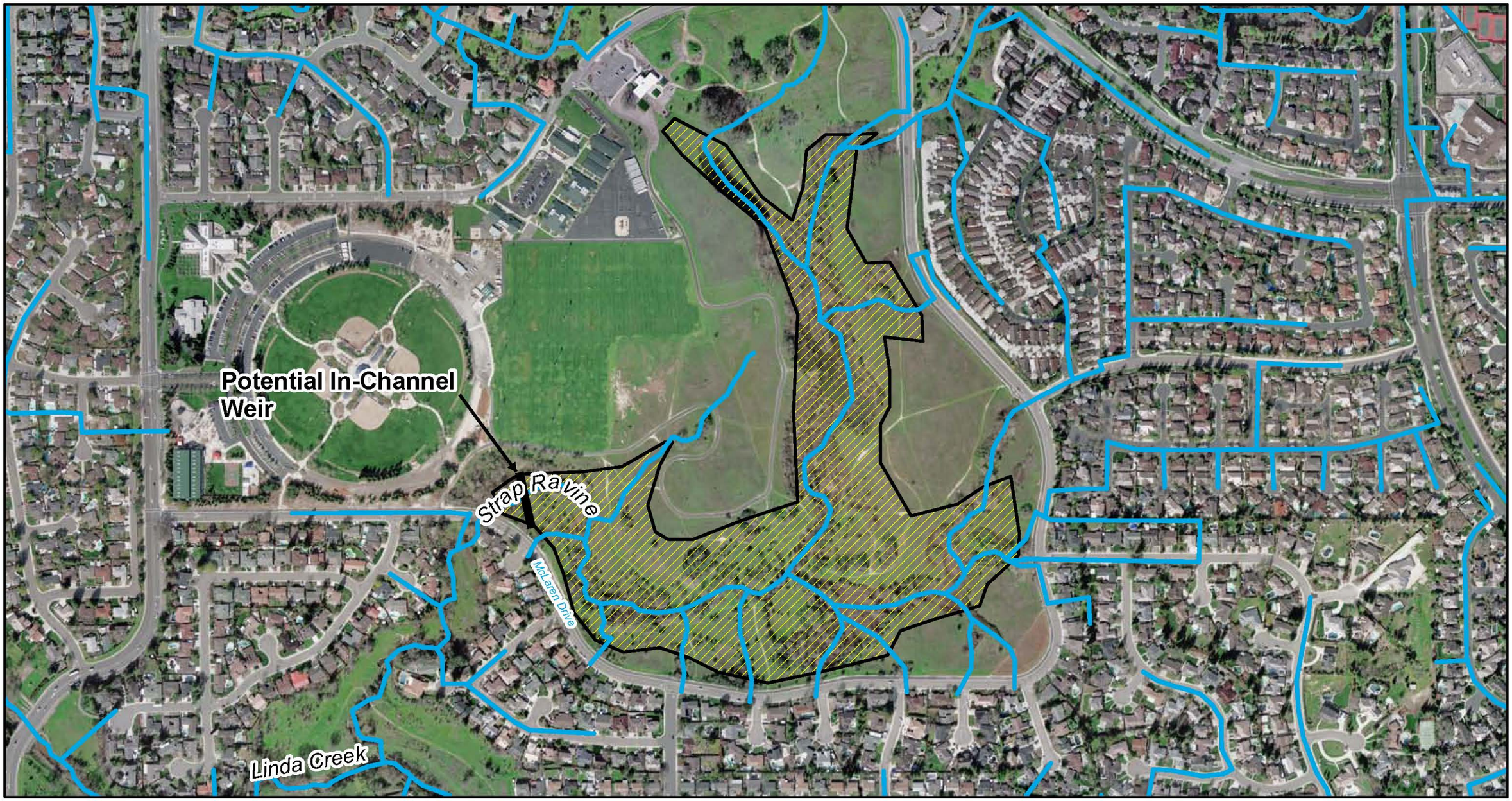
RBF CONSULTING | CIVIL ENGINEERING SOLUTIONS, INC.

0 100 200 Feet

1 inch = 200 feet

PLATE H10

STRAP RAVINE UPSTREAM FROM MCLAREN DRIVE AT MAIDU PARK



PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

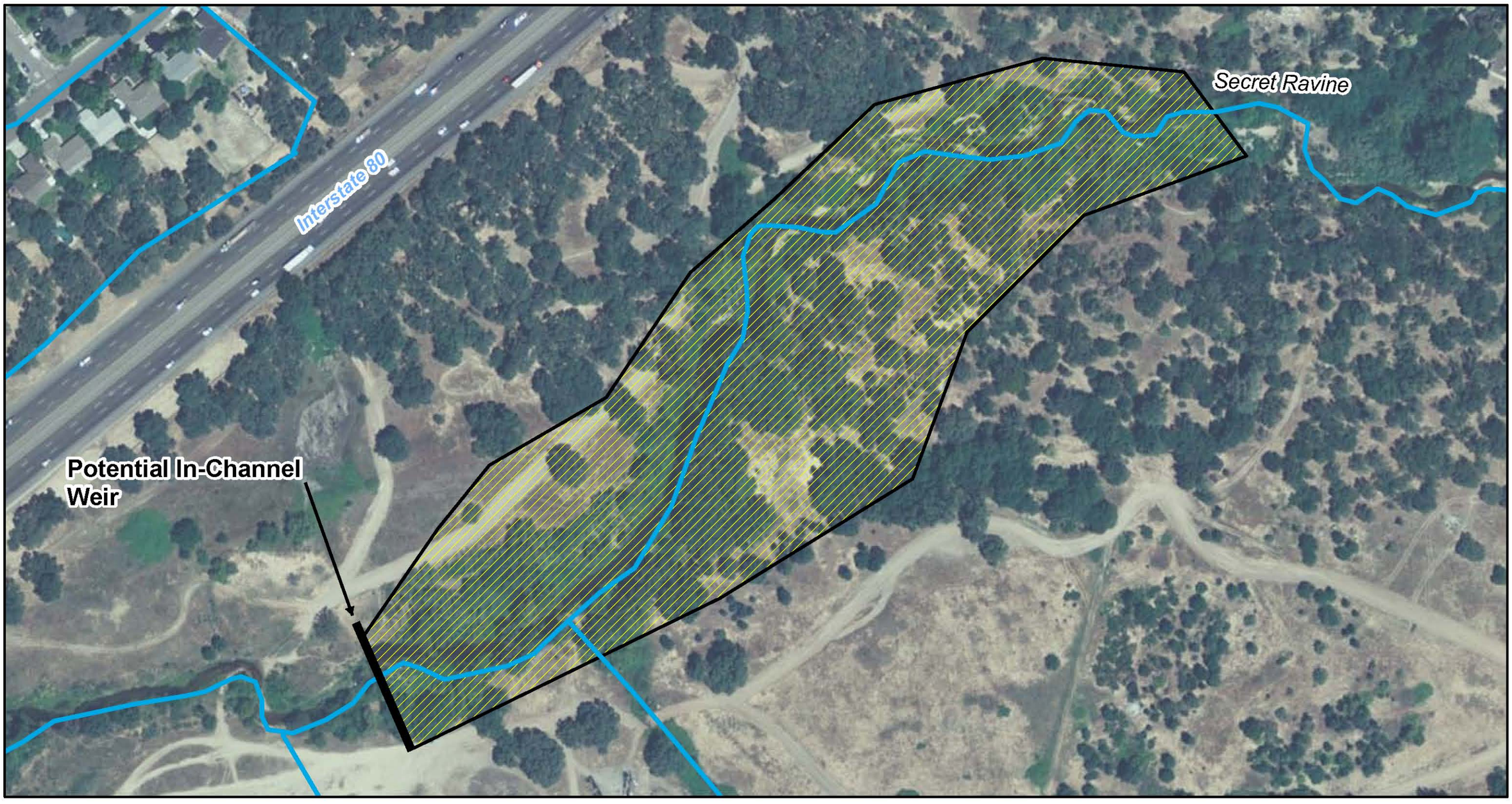
RBF CONSULTING | CIVIL ENGINEERING SOLUTIONS, INC.

0 400 800 Feet

1 inch = 400 feet

PLATE H11

SECRET RAVINE IN VISTA OAKS AREA



PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

RBF CONSULTING | CIVIL ENGINEERING SOLUTIONS, INC.

0 150 300 Feet

1 inch = 150 feet

PLATE H12